DENTAL TREATMENT NEEDS IN TWO SAMPLES OF SCOTTISH FOURTEEN-YEAR-OLD CHILDREN

An Epidemiological Assessment of Treatment Needs as an Indication of the Effectiveness of the Current Dental Services, with Recommendations for the Improvement of these Services in the Future.

by

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A Thesis Presented to the University of Glasgow for the Degree of Master of Dental Surgery.

December 1972

One of the urgent needs of highly developed societies is to identify ways of healthy living, the wisdom of the body and mind and the principles of social organisation that will reduce the burden of the chronic diseases and improve the quality of life. The quest for this knowledge is the main use of epidemiology.

USES OF EPIDEMIOLOGY - J. N. MORRIS.

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SUMMARY

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It is well known from epidemiologists' reports and from Government statistics that the state of children's dental health is poor. What is not known is the numbers of children who require various forms of treatment, and whether or not the available dental manpower will ever cope with the situation. To elicit this information is the general purpose of this investigation, which is the first study to examine treatment needs in such detail.

The study is based on the results of a dental epidemiological survey carried out during the period 1968-1971. The specific aims of the study are as follows:-

1. To assess the dental treatment needs of fourteen-year-old Scottish children.

2. To discover possible differences between the dental status and treatment needs of children living in an Urban environment, and those living in a Rural environment.

3. To discover possible effects of social class, and of dental attendance habits on dental status and treatment needs.

4. To study the relationship between treatment needs and toothbrushing, snack-eating, and spending on confectionery, and between

treatment needs and caries experience, oral cleanliness and periodontal disease.

5. To estimate the ability of the currently available dental manpower to control the level of dental disease recorded in this survey.

6. To make recommendations for the control of dental disease in children in the immediate future.

The fieldwork of this study was carried out by the author, with the assistance of a colleague, in one town and one county in Scotland. The town of Paisley was taken as representative of an Urban area, and 1544 subjects were examined in this area over a three year period. The County of Banff was taken as representative of a Rural area, and 640 subjects were examined in this area in one fieldwork period. The level of fluoride in the water supplies in both areas was similar, and the dentist-population ratios were 1:4300 in Paisley and 1:5500 in the County of Banff.

This study reports one of the highest values for the mean number of Decayed, Missing and Filled (mean D.M.F.) teeth that has ever been recorded in a school age population. This is 11.47 and relates to the Rural area where the caries experience (mean D.M.F.) is higher than in the Urban area. Rural children have more fillings per subject, but Urban children

have less plaque, less calculus and less gingivitis per subject than Rural children. These last findings are, however, only relative since the oral cleanliness of the Urban sample is poor, and the level of gingivitis is fairly high. Overall, 8.5% of the Urban sample, and 5% of the Rural sample required no treatment or only a lesson on oral hygiene. More Rural children needed fillings, and this is consistent with their higher mean D.M.F. Fewer Rural children needed extractions for caries or orthodontic treatment. This could be due to the available Rural dental services restoring teeth at an earlier stage, and anticipating crowding.

The difference between the Urban and Rural communities is quite clear. Urban children have better toothbrushing and snack-eating habits, a lower caries experience (mean D.M.F.), better oral cleanliness and less periodontal disease. Urban children have better dental health than Rural children. Rural children have more fillings, and need fewer extractions and less orthodontic treatment than Urban children. The Rural dental service would thus appear to be the more efficient of the two.

The effects of social class were measured by distributing the sample, according to the social class of each subject's father, into five social classes. The dental status findings and treatment needs were

then examined in each social class. A large number of significant differences were found, but no clear pattern emerged. These results are discussed, but it is felt that dividing a population into five social classes is no longer accurate in Britain's changing society. A second analysis is carried out, by dividing the sample populations into an upper and lower social strata. This had a more consistent effect on the results of the survey. The analysis shows that upper social strata children have fewer decayed and missing teeth, and more filled teeth than those in the lower strata, in the Urban area. Again, in the Urban area, upper social strata children have a better oral cleanliness. Only filled teeth follow this pattern in the Rural area. In both areas mean D.M.F. and periodontal disease are unaffected by this method of social classification. Treatment needs are not greatly affected by this socio-economic grouping of the population.

It is shown that children who claimed to have a dentist have a higher caries experience (D.M.F.) than those who do not. This is also shown for those who claim to attend their dentist regularly. Both of these findings are shown in each of the sample areas. Regular dental attenders have better oral cleanliness and less periodontal disease, and need less treatment. The results show that even

regular attenders need considerable treatment to complete their dental fitness.

A detailed study of treatment needs is made. It is shown that the section of the study population who brushed their teeth at least once per day need less treatment. No clear relationship exists between snack-eating and treatment needs, but those children who spent larger than average amounts of money on confectionery are more likely to need extractions for caries, and partial dentures. The children who need the most severe forms of treatment (extractions and partial dentures) have the highest levels of plaque. Children who required orthodontic treatment have a higher level of gingivitis and there is a definite trend towards more plaque, more calculus and a lower caries experience (D.M.F.) in these children.

In association with the results of this study, financial and practical considerations are presented to show that the dental profession cannot hope to cope with the reported levels of dental disease. To expect the current limited manpower to institute effective preventive measures at the same time is regarded as impossible.

Recommendations are made, which, if acted upon, would constitute a more practical approach to the

reduction of dental disease in children. Among these suggestions are:- the development of preventive dentistry units in association with the re-organisation of the National Health Service: the training of preventive ancillaries to promote dental health among school children: the re-orientation of the task of the dentist to allow priority care to be available to children, this care being prescribed by the dentist and applied by the ancillaries who staff the preventive dentistry units: continued support by the dental profession for water fluoridation: co-ordination and organisation of recruitment into the dental profession. These recommendations formulate a plan which would allow the majority of dentists to continue undertaking treatment and yet would encourage the prevention of dental disease on a community basis.

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CHAPTER 1. INTRODUCTION TO THE REPORT.

1.1 INTRODUCTION

Although there is a large number of reports on the Dental Health of various population groups, there is little data available in the literature about any Scottish population group. It is probably true that the dental fitness of the Scot, or the Scottish child, is little different from his counterpart anywhere else in the United Kingdom, but since there are variations in attitude, in manpower distribution, and in the fluoride content of water, and in many other contributing factors, it is of value to examine, in depth, the treatment requirements of a hitherto, overlooked population.

1.2 THE AIMS OF THIS STUDY

These are as follows:-

1) To assess, quantitatively, the dental treatment needs of a sample of fourteen-year-old Scottish children.
2) To discover possible differences between the dental status, and treatment needs of children living in an Urban environment, and those living in a Rural environment.
3) To examine for variations in the dental status and treatment needs of the subjects, due to the social class of the family, or to the stated dental attendance habits.

1.2/

4) To study the relationship between treatment needs and toothbrushing, snack-eating and spending habits, and between treatment needs and caries experience, oral cleanliness and periodontal disease.

5) To estimate the ability of the currently available manpower to control the level of dental disease recorded in this survey.

6) To make recommendations for the control of dental disease in children, in the immediate future.

1.3 THE VALUE OF THIS STUDY

The value of epidemiological studies of child populations was outlined in an editorial in the British Dental Journal (1,2). Baseline data are required to enable the most effective use of available manpower to be made. They are also useful to measure the effectiveness of the service provided, as well as of particular methods of treatment, and furthermore, give information about the natural ebb and flow of dental disease (1).

With these details, rational manpower distribution and planning may be aided, and the need for further, and greater preventive measures may be emphasised. At present decisions regarding manpower and efficiency of treatments have been made on an arbitrary basis.

1.3/ The dental profession must be prepared to abide by the findings of epidemiological reports which may be contrary to their long-held and long-cherished individual beliefs (2).

1.4 THE AREAS SELECTED

Two areas were selected for the study; an Urban area and a Rural area. The Urban area was the town of Paisley, in Renfrewshire, and is part of the Central Clydeside Connurbation. The Rural area was the County of Banff, stretching from the shores of the Moray Firth to the Cairngorms.

1.5 THE AGE-GROUP SELECTED

Only one age group of children was examined - the fourteen years of age group. This age was chosen for three reasons:-

1) This age group can be considered as representative of 12-16 years age-band.
2) The adult dentition, excluding the third molars, will be established.
3) It was, at the time, the oldest age at which the whole population can be found at school, so availability of the sample was easy.

CHAPTER 2. A REVIEW OF CURRENT KNOWLEDGE
1. THE EPIDEMIOLOGY OF DENTAL DISEASE.

2.1 INTRODUCTION

As this report will present the detailed findings of a dental epidemiological study of more than 2,000 Scottish children from an urban and a rural area, it is important to assess the current knowledge of the prevalence of dental disease in the country as a whole, with particular reference to reports on the state of children's teeth. It is well known that the dental diseases - caries and periodontal disease - cause a good deal of pain and misery, as well as inconvenience and economic loss. Will future generations of adults be less afflicted? Are the treatment services coping with the amount of disease? These are two of the many questions which this report may help to answer.

2.2 THREE GENERAL STUDIES OF CHILD DENTAL HEALTH

The Interim Report of the Scottish Standing Committee on Dental Health Education (1960) (3) reported that by the time a typical Scottish child enters school at five years of age he will have about seven of his twenty temporary teeth decayed, filled or already extracted. The situation deteriorates as the child becomes older, and the report pointed out that a fourteen-year-old child in Ayr had twelve teeth decayed, missing or filled, whereas it had been eight, four years previously. Reference was also made to the rising number of children wearing dentures, and, taking all factors into consideration the Committee were convinced that the state of children's teeth was deteriorating.

2.2/ Many more individual reports have been published since 1960. Many are concerned solely with the prevalence of caries, others with the prevalence of periodontal disease and some are a comprehensive examination of the dental state of a particular population group.

Stephens, (1964) (4), expresses his view of the dental health of English school children in an unusual manner. He calculated that 4 million teeth were extracted and 7½ million teeth were filled every year, and that an estimated half-million teeth that were diseased, did not receive treatment. He extrapolated this to say that 34,000 teeth decayed every day, at a rate of one tooth every 2½ seconds! To control the dental disease of the child population in England and Wales, Stephens estimated that 11,000 dentists would be required, and this was equivalent to the total available manpower at that time.

In 1964, an important dental health report of a Scottish area was published. McHugh, McEwen and Hitchin (5), studied the dental disease and related factors in approximately 2,900 thirteen-year-old children in Dundee. This report will be referred to often during the discussion of the results of the current report, but among the main findings were:-

2.2/

1) A total mean D.M.F. of 10.02 teeth per child.
2) Gingivitis in more than 99% of the subjects; more marked in boys than girls.
3) A significant correlation between oral hygiene and gingivitis in both boys and girls.
4) A significant correlation between stated "sweet" consumption, and the number of decayed teeth.

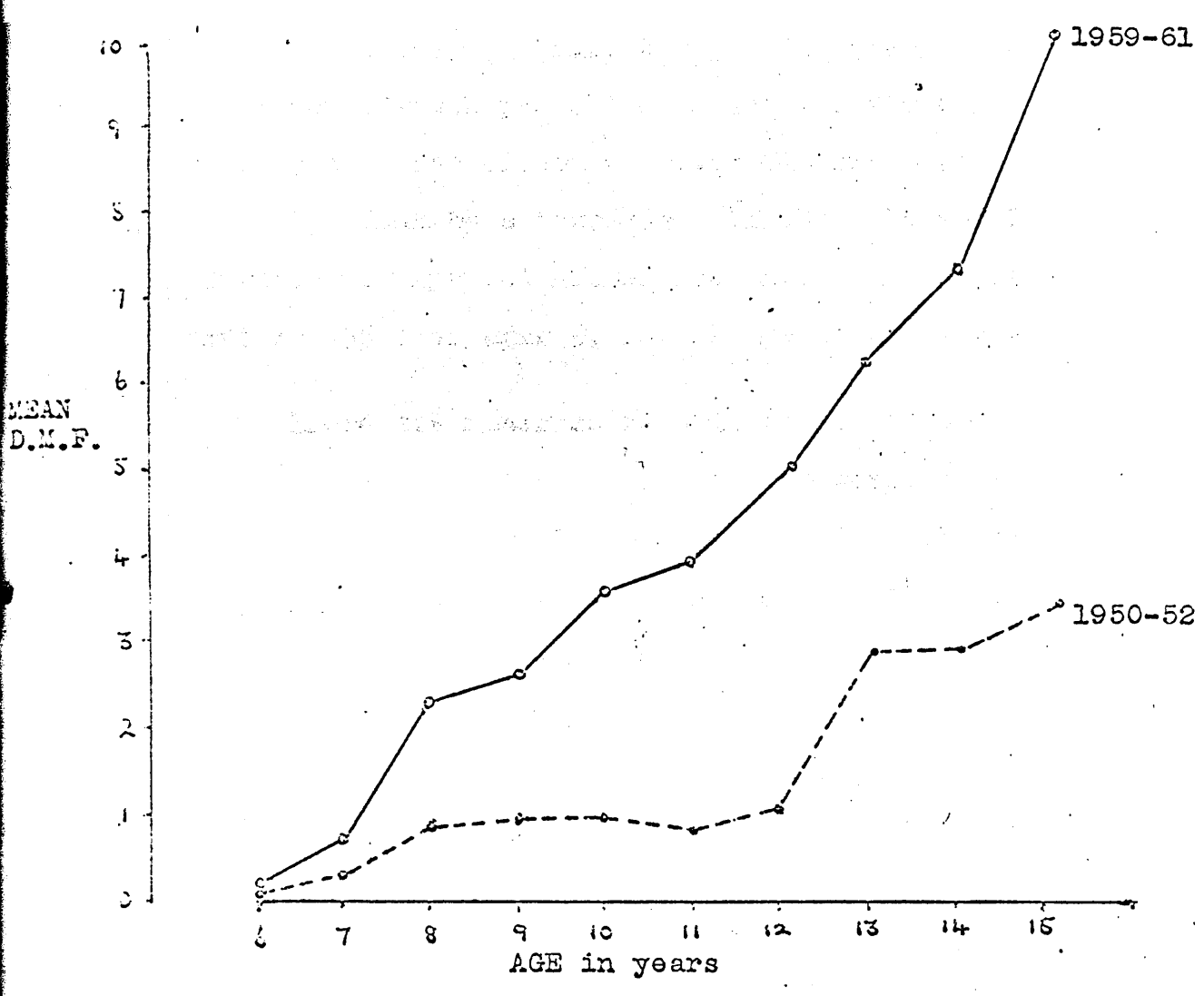
2.3 DENTAL CARIES

It is now quite clear that dental caries prevalence decreased during and after the war, not only in Britain but in most European countries. In the less immediate post-war years, however, the prevalence has been increasing. Although caries is recognised by all authorities as a multifactorial disease, there is overwhelming evidence that degradation of ingested carbohydrate by the bacterial deposits - the bacterial plaque - is the most important factor. Gustafsson et al (1954) (6) aptly demonstrated the effect of consumption, at various times of the day, of several types of carbohydrate, on the incidence of dental caries. Toverud (1956-57) has shown that, during the war, and immediately afterwards, when there was a reduction in sugar consumption due to rationing, the incidence of caries decreased.

2.3 James (1965) (8) also investigated this trend, and his results are shown in Figure 1. The continuing rise in the standard of living and of income, associated with high pressure advertising of confectionery on television, soon resulted in the fact that the consumption of sugar and sweets was higher in Britain, per capita, than anywhere else in the world (8). Consequently the incidence of dental caries continues to rise. The situation is complicated by the uneven distribution of dental manpower, both in the general dental services, and in the local authority dental service. The latter service has the great advantage that it actively seeks out the child and offers treatment, and, in many areas, actually brings treatment facilities to the school. On the other hand, this service has to spread its manpower resources very widely.

The child population has better access to dental treatment in the city areas, especially in the London and South East area, where the dentist population ratio is lowest, although in this case it is the initiative of the parent to seek treatment for the child.

No brief review of the state of children's teeth would be complete without reference to the Fluoridation studies in the United Kingdom (9). These studies were the result of the 1952 Mission, to study fluoridation in North America. One of the United Kingdom trial areas was in Scotland, the town of Kilmarnock. Ayr



The caries prevalance in boys aged 6 to 15 years in the periods 1950-52 and 1959-61

James(1965)(8)

Figure 1.

2.3 was chosen as control. Fluoridation began in 1956 and ended, by decision of the town council, in 1962. It is not intended to comment on the results of the study but to state the findings of the dental investigations. Figure 2 shows the average number of decayed teeth per child in the two towns in 1956 and 1968. The effect of water fluoridation is most clearly shown by a comparison of the 1956 and 1968 figures for Ayr and Kilmarnock children who were born after 1956 i.e. ages 9, 10, 11 and 12 in Figure 2.

There are numerous reports on the amount of dental caries in other parts of the world. Figure 3 shows the dental caries experience of fourteen-year-old children in New Zealand and Massachussets (Dunning, 1970) (10). The mean number of decayed, missing, and filled teeth is approximately 11 and 10 respectively. An interesting report from Malta Olivieri-Munroe (1968) (11) states the caries experience to be 2.69 teeth per child (aged 13). This is of particular interest since the fluoride level of the water in this area does not approach the optimum.

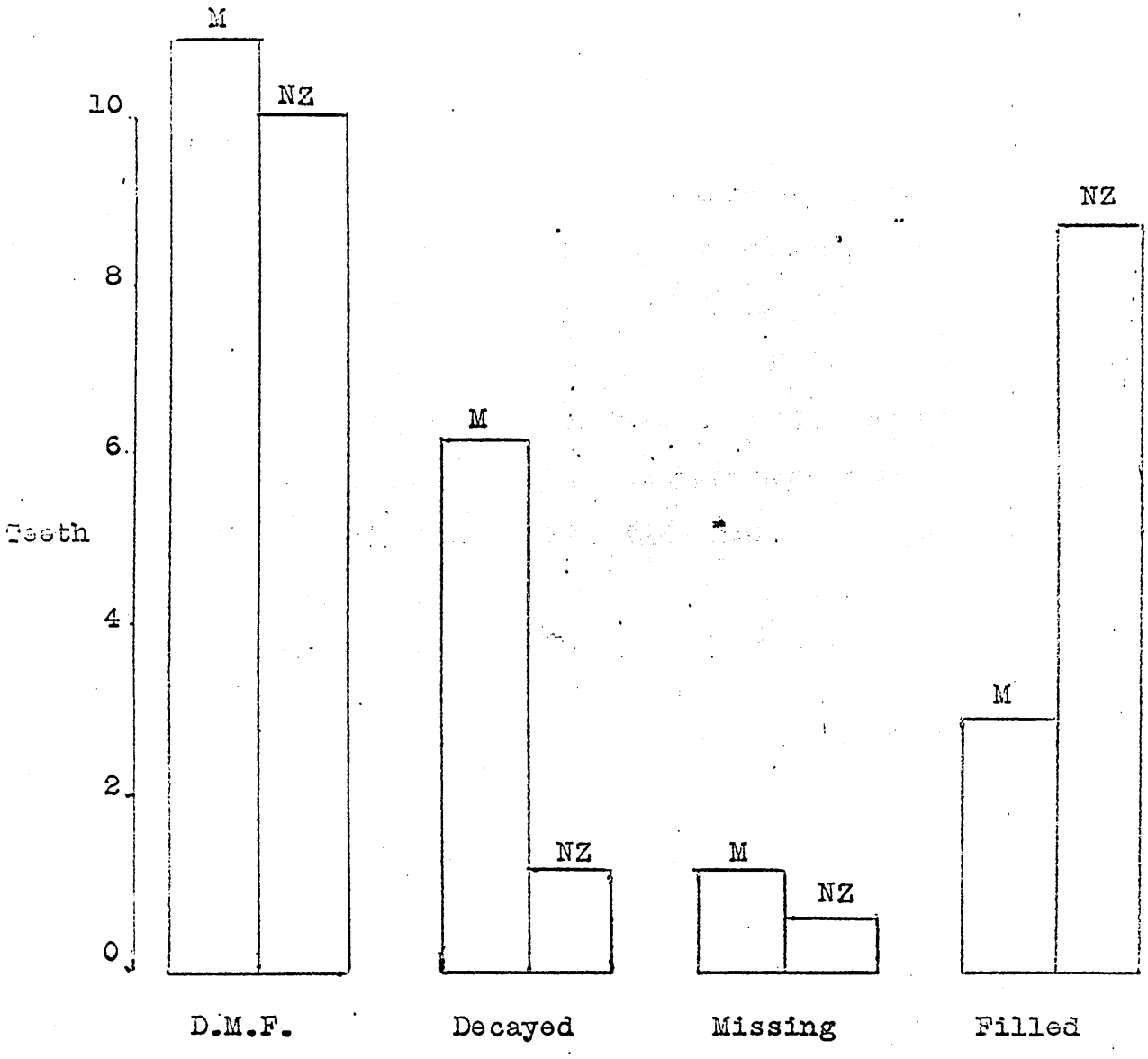
Ethnic background has long been thought to affect the susceptibility to dental disease, due to heredity and different dietary and oral hygiene habits. Holloway, James and Slack (1963) (12), showed that the teeth of the islanders from Tristan da Cunha deteriorated rapidly when supplies of refined carbohydrate were

AGE GROUP	AREA	Average Number of Decayed teeth per child (D.M.F.)	
		1956	1968
9	AYR (CONTROL)	3.7	4.2
	KILMARNOCK (STUDY)	3.4	3.7
10	AYR	4.5	5.3
	KILMARNOCK	4.4	4.1
11	AYR	5.4	6.5
	KILMARNOCK	5.8	4.9
12	AYR	7.3	9.1
	KILMARNOCK	7.4	6.6
14	AYR	8.7	12.4
	KILMARNOCK	9.0	9.6

Extract of results of dental examinations of children in Ayr and Kilmarnock. (Part of United Kingdom Fluoridation Studies)

Publ. Hlth. and Med. Subjects Reports No. 122
H.M.S.O. London (9)

Figure 2



Dental Caries experience among 14-year-old children of New Zealand and Massachusetts

Dunning(1970)(10)

Figure 3.

2.3/ introduced to the island. A recent report from London (Downer, 1970) (13) studied the dental state of girls from different ethnic backgrounds, who attended the same school. The negro group of 13 - 14 years of age showed evidence of a lower prevalence of caries experience than the European group of the same age. In the Sudan, Emslie (1966) (14) found that the mean D.M.F. value ranged 0.7 at the ages of 10 to 14 years to 1.6 at the ages 30 to 39 years. This author found that up to 89% of his 10 to 14 year age group were free of caries. Sheiham (1967) (15) studying Nigerian populations, found very low D.M.F. values, and stated that 98% of the subjects were free of caries.

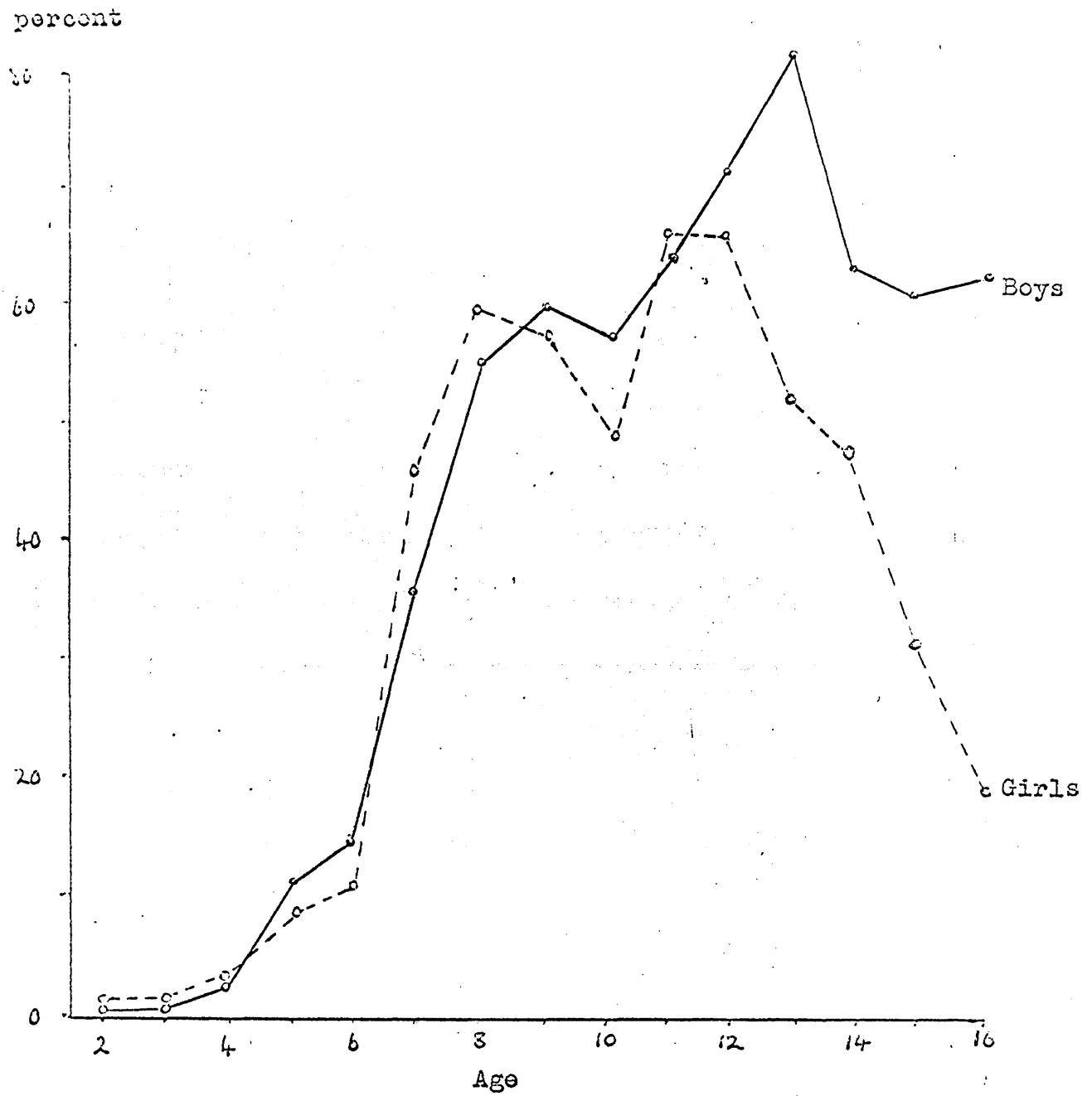
It can be seen from this brief review of published reports that caries experience varies in different parts of the world. Preliminary results of this study have been published (Stephen and Sutherland, 1971) (16), reporting that the mean number of teeth affected by caries in children in Paisley in 1968 was 13.04. This is the highest value yet reported in the United Kingdom.

2.4 PERIODONTAL DISEASES

Compared with the history of dental caries, it is only in recent years that it has been realised that periodontal disease has its origins in childhood, and there are few reports of the periodontal state of United Kingdom school children published before 1960.

2.4.1 Gingivitis

James (1963) (17) reported on the gingival state of a group of children in a residential home (Figure 4). These results show an increase in the prevalence of gingivitis after the age of 6 years. This may be due to the eruption of teeth that is occurring at this time. The maximum percentage of children with gingivitis, recorded by James, is 72% in 13 year old boys. Several estimates of gingival health have been carried out on the "good, fair or poor" basis of assessment (11, 12, 17). This detracts from their value, as it does not lend itself well to comparison. Assessment of gingivitis is almost of necessity subjective and vague. It does not lend itself well to objective measurement. Indices, for the objective assessment of periodontal diseases, will be discussed in a later chapter (Chapter 6). As previously reported, McHugh et al (1964) (5) found that the incidence of gingivitis in 13 year old children in Dundee was over 99%. It would appear to be generally agreed, from reports over the last few years that the incidence of gingivitis in children varies, but the variation is between 90% and 100% (Figure 5). Since direct comparison of results is likely to be inaccurate, this can be taken to mean that almost all children have gingivitis to some degree.



The percentage of children,aged 2-16 years,with gingivitis.

James(1963)(17)

Figure 4.

Area	Incidence	Author
America	90%	Marshall-Day, 1951(18)
India	97%	Greene, 1960(19)
England	95%	Parfitt,1957(20)
India	100%	Ramfjord,1961(21)
Scotland	99%	McHugh et al,1964(5)

Reported Incidence of Gingivitis in Children

Figure 5

2.4.1/ Gingivitis levels may vary between boys and girls. Sinclair and Goose (1966) showed that gingivitis in boys remains more or less steady from 12 years to 17 years whereas girls show a fall within the same age group; this fall could be due to better oral hygiene as girls get older, or to the effects of puberty. Sheiham (1969) (23) examining Surrey school children also showed a slight tendency for periodontal disease levels to be lower in girls who had commenced menstruation, than in girls who had not. This paper will be studied in greater depth when the results of this study are presented (Chapter 9).

2.4.2 Chronic Periodontal Disease

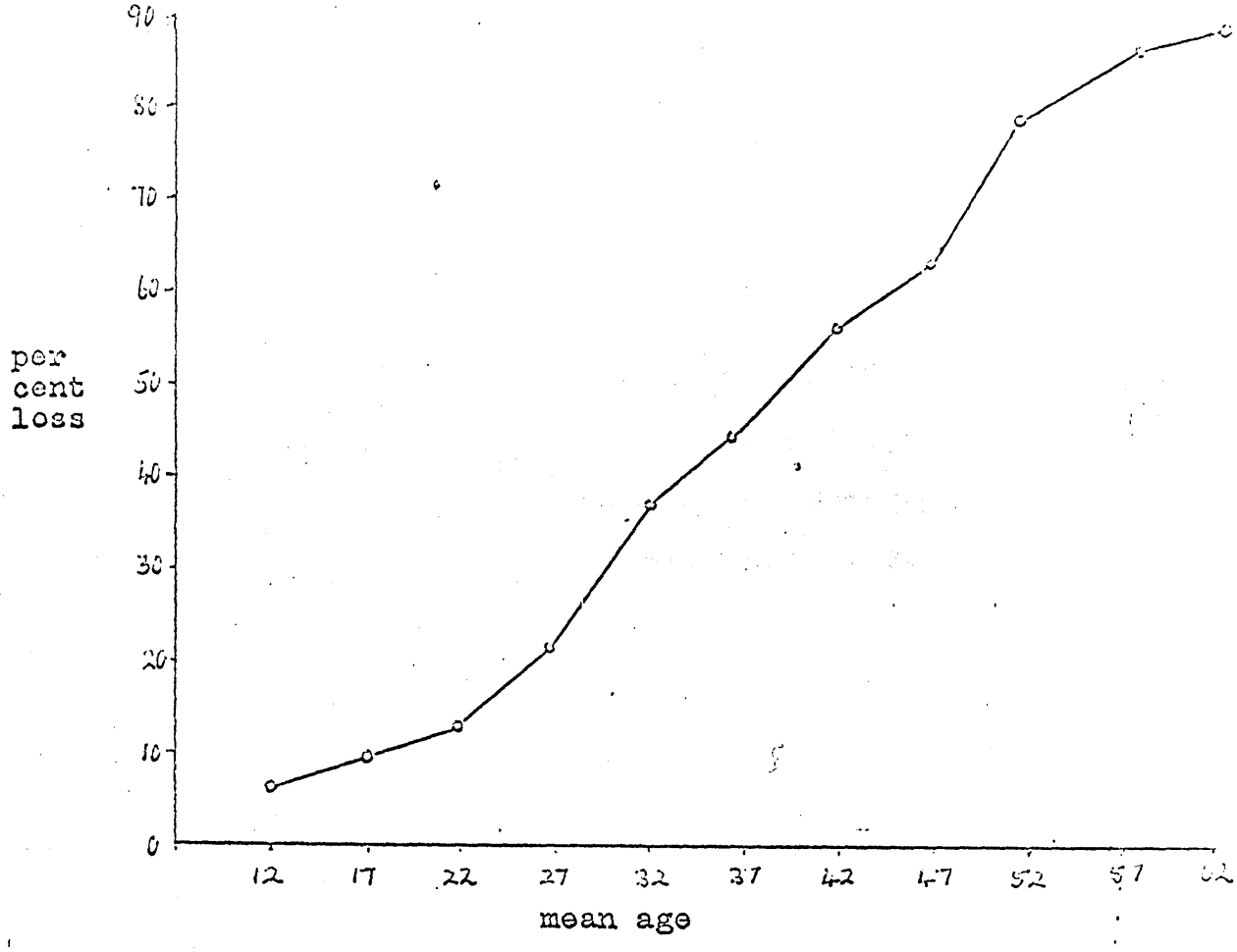
Gingivitis in the child is most likely to lead to chronic periodontal disease in the adult. World Workshop on Periodontics (1966) (24) considers that every adult shows some evidence of destructive periodontal disease. This is confirmed by many reports:- Sheiham (1969), U.K.(25); Greene (1957), and Ramfjord (1957), India; Waerhaug (1960), Ceylon; Emslie (1961), Nigeria; Held (1962), Iran; Emslie (1963), Sudan. (26).

2.5 TOOTH MORTALITY

Dental caries and periodontal disease, both present to a considerable degree in the average child's mouth, are both diseases which lead to loss or mortality of teeth. There have been many studies on tooth mortality,

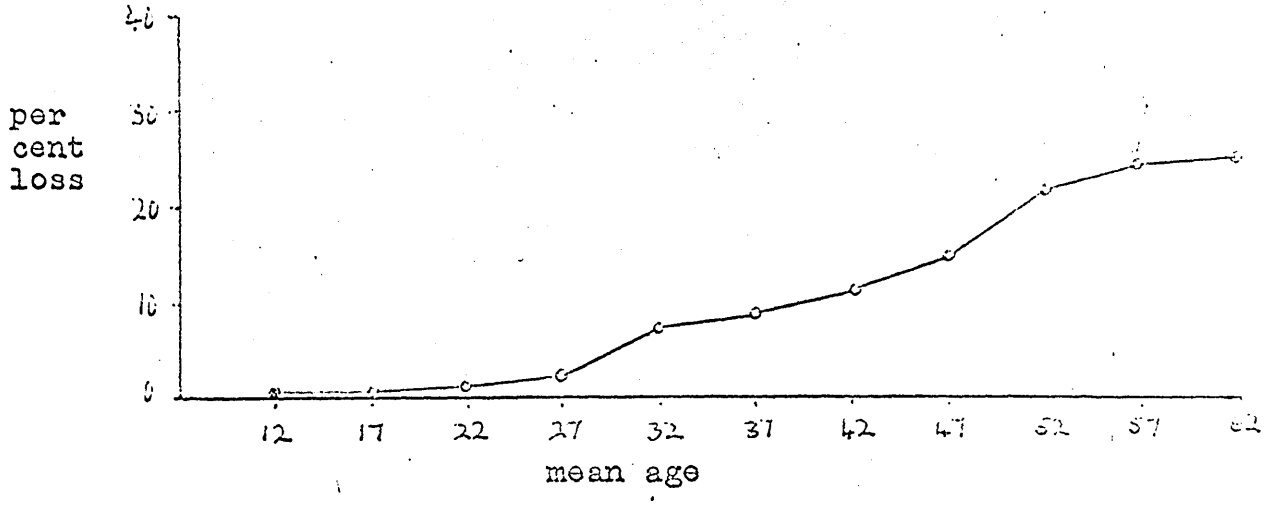
2.5/ or patterns of tooth loss in recent years. Figure 6 shows the percentage tooth loss for a series of mean ages from 12 years to 62 years (Jackson (1965) (27). There appears to be three phases of loss; up to the mean age of 22 years, from 22 to 47 years, and from mean age of 47 years onwards. The same three phases are shown by Jackson in tooth loss from periodontal disease (i.e. caries-free tooth loss)(Figure 7.) He concludes that up to 25 years, caries-free teeth account for only 2%, and that the main reason for loss is caries. From this age more and more sound teeth are extracted as the proportion lost through periodontal disease increases. Crabb (1966) (28), examining a selected population attending the Conservative department of a teaching hospital, substantially agreed with these figures. Sheiham, Hobdell and Cowell (1969) (29), testing the hypothesis that there is a regional variation in patterns of tooth loss, studied industrial population in London and Lancashire. He concludes that there is a regional variation, and feels that this explains the difference between his overall results and those of Jackson (1965).

	Sheiham et al	Jackson
25% of teeth lost	35-39	3rd Decade
50% of teeth lost	45-49	4th Decade
75% of teeth lost	55-59	5th Decade



Mortality of Permanent Teeth

Figure 6.



Mortality of Caries-free Teeth

Figure 7.

Jackson(1965)(27)

2.5/ Sheiham's figures for the Warrington area were similar to Jackson's in Leeds. Under the age of 35, Warrington people had lost twice as many teeth as London people. The youngest age group in Sheiham's study was 15 - 19 years, and a mean number of 1.53 teeth were missing. Sheiham suggests that the reason for variation in pattern of tooth loss was regional differences in the attitudes of public, and dentists, to dental health. Figures for the mortality of permanent teeth in children are not often published, but Bulman, Richards, Slack and Willcocks (1968) (30) report the total mean number of missing teeth (children 11 - 15½) as 1.4 in Salisbury and 1.9 in Darlington. A preliminary report of this study (Stephen and Sutherland, 1971) (16) showed that fourteen-year-old children had 2.23 missing teeth in 1968.

2.6 PREVENTIVE MEASURES AND THEIR EFFECTIVENESS

There are many reports, both scientific and clinical, in the dental literature to show that caries is preventable. Much of this evidence concerns the use of fluoride.

Early observations in the United States of America indicated that the amount of decay was lower than average where the amount of fluoride in the water supply was higher than average. These observations were confirmed, and it was determined that water with a level of one part of fluoride per million parts of water was the optimum

2.6/ level for controlling caries (9, 10, 103). The fluoride ion is incorporated into the enamel of forming teeth substituting for the hydroxyl ion; fluorapatite is formed instead of hydroxyapatite, and this is much more resistant to acid decalcification in the mouth (104). The United Kingdom Fluoridation Studies (9), already referred to, conclude that correction of the level of fluoride in the water supply to 1 part per million is a highly effective and safe way to reduce dental caries. This public dental health measure has been shown to reduce caries by between 35 and 94 per cent (10).

Fluoride can also be applied systemically by tablets or lozenges. This is a method for home-use and requires co-operation from the individual concerned. It combines the advantages of systemic and topical fluoridation, if the tablets are dissolved in the mouth prior to swallowing. The effect of this method is as good as that of water fluoridation, if the routine is adhered to systematically (10, 105).

Fluoride may be applied topically in the form of a gel, by a dentist or ancillary, but this affects only the outer layers of enamel of erupted teeth. It may be expected to reduce caries by about 40% (10, 106). Another method of topical application is by rinsing with fluoride solutions, and fluoride may also be applied to

2.6/ the teeth in a dentifrice. Torrell and Ericsson (1965) (107) have studied the effect of these three methods of topical application and conclude that rinsing with a dilute fluoride solution produces the greatest benefit.

Attempts to reduce caries by additions to the diet are intended to make bacterial plaque less effective in decalcifying enamel. Dextranase has been shown experimentally to reduce the adhesiveness of plaque by breaking up the sticky extracellular polysaccharides of the plaque matrix (108). Phosphates have been tested and show an effect in buffering the acidity of plaque, and hence, reduce decalcification. Both these methods are still experimental (109).

It has been shown that fluoride has its maximum effect on the smooth surfaces of the teeth, since bacterial plaque is less easily removed from the pits and fissures of occlusal surfaces (104). Acidity in these areas may produce a carious lesion even if the tooth is fluoridated. In recent years there has been a development of a method of sealing the occlusal surfaces of caries-free teeth with an adhesive sealant which is polymerised by ultra violet light (110, 111).

Several studies of the effect of carbohydrate restriction on dental caries have been made (10), and the conclusions are that limitation of sticky foods, especially between meals will reduce the amount of

2.6/ dental caries.

It is clear that fluoride, fissure sealants, and dietary control can reduce the incidence of dental caries. Some methods are more effective than others, some are more easily applied to a patient or to a community, and some are more expensive than others, but these methods are available to the dental profession to reduce, substantially, the level of dental caries.

Control of bacterial plaque by the practice of good oral hygiene procedures is the best method of preventing periodontal disease (112). The major difficulty in the control of this dental disease lies in communicating successfully with the patient or public, that plaque control is important. Although scientific evidence on the cause of gingivitis is confusing it is clear that bacterial plaque has a direct relationship with periodontal disease (112).

Measures for the control of dental caries and periodontal disease have been discussed. This knowledge should enable dentists to undertake preventive measures to reduce the levels of dental disease.

2.7 CONCLUSIONS

This review of current knowledge shows that there is considerable evidence that dental disease is preventable, or that it can be considerably reduced in severity. There is also a wealth of data available

2.7/ in the literature concerning dental disease levels in various population groups. Many of the epidemiological studies carried out to produce these reports have used study populations similar to the ones used in this report. However, this is a study of treatment requirements and it is considered unscientific, and even unwise, to base such a study on the dental findings of other epidemiologists who have studied similar populations. Hence, the basis of this report is an epidemiological study, and the results of this study are used to assess the need for treatment.

CHAPTER 3. A REVIEW OF CURRENT KNOWLEDGE II SOCIO-ECONOMIC STATUS AND THE COMMUNITY FACTOR.

3.1 SOCIO-ECONOMIC STATUS

In this survey, each subject was asked to state his/her father's occupation. This was done so that the social class of the child's family could be estimated.

McMahon, Pugh and Ipsen (1960) (31) state that socio-economic status may be measured by one of several methods, viz.

1) Occupation.
   This, these authors state, is "one of the basic indices of the elusive concept of 'socio-economic status' ".

2) Family Income.
   The main criticism against this method is the difficulty of obtaining this information from an individual who may be unwilling to disclose details, or from a family member, who may not know.

3) Area of Residence.
   This is mainly of use in urban areas, and the reliability may vary from one area to another, or even within one area.

4) Combination of Variables.
   e.g. income, rental, family size, occupation, education, residence. This method is useful if developed by an individual, but as a method

3.1/ readily available to compare with other work it is impracticable, since other authors may not use the same variables.

5) Other particular methods have been used, e.g. taxpayers - non-taxpayers; peers - general population; officers - privates.

In the U.K. The General Register Office Scale of Social Class (32), has been in use for some 50 years. It was devised by Stevenson - the General Medical Statistician at that time - who based the scale on people's occupation, observing:

1) their level of skill and role in production.
2) their general "standing" in the Community.

Morris (1964) (33) states that the classification is thus a simple picture of poverty/property, privilege/under privilege, gratification/deprivation, a scale of equality and inequality in "life's chances" in Britain's changing, but still class-ridden, society.

Morris continues:

"It is not surprising that, very crude as it is, and blurring now in several aspects, this distinction by "social class" is still proving a powerful tool in the exploration of physiological and physchological

3.1/ processes, of physical, mental and social disorder, of the health that people enjoy, the diseases they suffer, and, though less than formerly, the treatment they receive."

1.1 Socio-economic Status and Dental Caries

A large number of studies have considered the role of socio-economic status and its associated concomitants, occupation, income and education, as they affect the incidence of dental caries. Most of these studies reflect a significant correlation between the presence of dental caries and socio-economic status. Caries is a reflection of untreated disease and its presence can be equated with a failure to seek treatment. A review of utilisation of dental resources Richards (1971) (34) suggests a strong relationship between socio-economic status and visits to the dentist. In another review, Richards and Barmes (1971) (35) quote the results of two studies, one in Oregon, and one in Czechoslavakia, that suggest that there is no relationship between a parent's occupation and the incidence of caries in his or her child. This is a surprising statement since most British epidemiological reports involving social class use the Registrar-General's classification referred to above. This classification is, however, valuable in that it groups a population into broad socio-economic bands, which relate to a group of occupations rather than to individual occupations.

3.1.1/ The largest study to include an investigation of socio-economics was the National Health Survey in the United States. Income and education were found to be significantly related to the D.M.F. count (36).

In Malmo two groups of children - one with a high and the other with a low D.F. (number of Decayed and Filled Teeth) were examined by Köch and Martinssen (1970) (37). After interviewing the mothers, they reported that there was a significantly greater number of children with a low number of decayed and filled surfaces in the upper socio-economic groups.

McCauley and Frazier (1957) (38) produced no significant correlation between caries experience and social class in Baltimore. However, the method of determining social class was by mean monthly rental - an example of a method which is not so well recognised for comparison, and difficult to duplicate. This may account for the results of this study not reproducing the recognised relationship.

A further study of children which have taken the family social class into account shows that children from high income families need less treatment (Wisan, Lavell and Colwell, 1957) (39). Fanning, Gotzamonos and Vowles (1969) (40), examining South Australian school children, suggest that there could be an economic factor which has a considerable effect in

3.1.1/ preventing some children in this area from receiving total dental care.

Bulman et al (1968) (30) in a study of dental health and attitudes to dentistry in two communities, reported that manual workers had more missing teeth than non-manual workers. The difference was found to be greater in Salisbury, where there was a more favourable dentist/population ratio. The difference reported was, however, similar in all age groups in both towns. Also, in both areas, but, again, especially in Salisbury, non-manual workers had more restored teeth than manual workers. Sheiham and Hobdell (1969) (41) did not feel that observed differences in D.M.F. were consistent in their relation to social class, but they did show that lower social classes had more teeth missing.

Studying Scottish children, Mansbridge (1959) (42) showed a higher prevalence of caries among the higher social classes.

Mansbridge (1959) studied children who attended state and independent schools in Scotland, and reported that children at the independent fee-paying schools had a higher prevalence of caries in the permanent teeth. Sheiham (1967) (15) found that Nigerian children attending private schools had a higher caries rate.

3.1.2 Socio-economic Status and Periodontal Disease

Several studies have shown that, in children, low periodontal involvement is associated with higher socio-economic class and that a higher periodontal involvement is found in the lower socio-economic groups: Mobley and Smith (1963), Moore, Muhler and McDonald (1964), Goose (1967), (43-45). Sheiham (1969) (23) however reported no difference in periodontal condition between children where parents were of high and of low socio-economic status.

In adults similar correlations have been found (Bulman et al, 1968 (30): Waerhaug, 1967 (46)), and Sheiham (1969) (25) found that the severity of periodontal disease was related to social class in men but not in women.

A social factor, measured fairly well by individual and community levels of education has been shown by Russell (1957) (47) to be closely related to severity of periodontal disease, and he suggests that the determining factor is social rather than economic.

A review of the studies of periodontal disease severity which have included correlation with socio-economic status, shows clearly that there is a good correlation between periodontal disease and socio-economic status.

3.2 THE COMMUNITY FACTOR

Dental disease is a ubiquitous phenomenon, and no area or group of people has been reported to be free from it. The literature reviewed in Chapter 2 shows the amount of disease varies from area to area, even within one nation. The term "community factor" is a general term used to indicate that the community background of a group of people can be used as a variable in an analysis of their dental status. Such variables as have been used are Urban and Rural areas; Farming and Fishing areas; Island and Mainland areas; Private and Public Housing areas (although this also relates to socio-economic status) (35).

In this study, the community factor that is investigated is the difference in the dental health between those living in an Urban area and in a Rural area.

2.1 The Community Factor and Dental Caries

In their review article, Richard and Barnes (1971) (35) state that a large number of studies have compared caries prevalence in Urban and Rural communities. They state:

"In general, caries prevalence is lower in rural than in urban communities, but services are more available in urban areas, hence untreated caries is likely to be higher in rural communities."

3.2.1/ In Urban areas, including the Urban area in this study, the availability of dental services is higher, thus it is to be expected that there will be more treated caries in Urban areas. This fact tends to mask whether caries is more prevalent Rurally, and so an index of total caries experience will be valuable since it will include those teeth that were carious but are now filled. A report from Japan (Yamada, 1967) (48) quoted by Richard and Barmes (1971) (35) showed that children from coastal fishing villages showed a significantly higher prevalence of caries than those on inland farms.

2.2 The Community Factor and Periodontal Disease

The effect on periodontal disease prevalence of living in an Urban area is by no means clear from previous reports. The United States National Health Survey (1965) (49) found no significant association between periodontal disease and population density. Mobley and Smith (1963) (43) report little association between the two factors. In a review paper of surveys by Ramfjord et al (1968) (26) in Ceylon, India, Iran, Nigeria and Sudan, there is a slightly higher periodontal score in Rural areas reported. Goose (1967) (45) however suggests that the periodontal condition of children is probably better in country districts than in towns.

3.3 CONCLUSIONS

In this study of dental health and treatment requirements, socio-economic status and the community

3.3/ factor will be discussed. It is pertinent to examine these variables, to see if the available treatment services are equally effective in each social strata of the population, and to see if the community factor affects the availability of dental care. The literature has suggested several associations between these, and other, social factors and dental disease, but these are not in the nature of casual relationships. Richards and Barmes (1971) (35) state:

> "Such social correlates as income, education, and occupation may not in themselves cause disease, but they can clearly play a major part, when it is seen that, even in the hypothetical case where oral disease is equally distributed amongst all population groups, there may be different levels of demand for treatment between those groups".

The literature would appear to be inconsistent in its findings. Social class has been shown by many workers to play a significant role in differentiating between various population groups as regards both caries and periodontal disease, although it does not always appear that increasing social status is related to increasing dental health. Studies of the effect of community factors on dental disease present no clear conclusions.

CHAPTER 4. THE DENTAL SERVICES IN THE SAMPLE AREAS

4.1 GENERAL DENTAL SERVICES+

The number of surgeries and dental surgeons in Paisley during the period of the fieldwork was as follows:-

	No. of Surgeries	No. of Principals	No. of Assistants
1.4.68.	17	19	3
1.4.69.	17	19	3
1.4.70.	15	18	3

This represents a dentist-population ratio of approximately 1:4300.

In the County of Banff, during the fieldwork period there were 8 dentists, practicing in the 3 main towns, with surgeries in a few of the outlying smaller towns. This represents a dentist-population ratio of approximately 1:5500. One dentist from a neighbouring county had a second surgery in Banff County, but this could not effect markedly, the dentist-population ratio. The above figures are approximately similar to the observations of Cook and Walker (1967) (50) although these workers did not refer to Paisley and the County of Banff individually.

+ Information supplied by the respective National Health Service Executive Councils.

4.2 LOCAL AUTHORITY DENTAL SERVICES+

In Paisley there were 3 dentists on the local authority staff during the fieldwork period. The percentage acceptance of an offer of treatment from these children who had dental defects, and were offered treatment was:-

1968 - 56.61%

1969 - 64.61%

1970 - 74.38%

The mean percentage acceptance rate during the period of this study was 65.20%.

In the County of Banff there were 2 local authority dentists and the percentage acceptance figure of those who had defects and were offered treatment was 63.82%. In view of the smaller number of general practitioners in this Rural area, the percentage acceptance figure could have been expected to be higher than the Paisley figure, i.e. where there are less general practitioners available the local authority should have a higher acceptance rate.

+ Information supplied by the Office of the respective Chief Dental Officers.

CHAPTER 5. ORGANISATION OF THE FIELDWORK

5.1 INTRODUCTION

The fieldwork for this study was undertaken in two areas of Scotland, at the invitation of the respective Chief Dental Officers, in the town of Paisley, Renfrewshire, and the County of Banff. The Paisley study was completed over three years, the examinations being carried out in the Spring of 1968, 1969 and 1970. The Banff study was completed in the Autumn of 1968. The co-operation of the Director of Education in both areas is greatly appreciated.

5.2 THE FIELDWORK AREAS

2.1 Paisley

Paisley is a town of approximately 95,000 inhabitants, situated some 7 miles west of Glasgow. It is an industrial town with a representation of almost all types of industry. The level of fluoride in Paisley drinking water is negligible. All the Secondary Schools in the Burgh of Paisley were visited in the course of the fieldwork.

2.2 Banff

Banff is a long, narrow County of considerable physical contrasts, extending from the high Cairngorms in its south-west extremity, through a mainly agricultural countryside around Keith to the characteristic fishing villages and towns along the rocky, cliff-bound coast of the Moray Firth. The population of the County of Banff is approximately 44,000; the main industries

5.2.2/ employing labour being farming and fishing. Children from the fourteen-year-old age group were examined at the following fourteen centres throughout the County: Aberchirder, Aberlour, Banff, Buckie, Cullen, Dufftown, Findochty, Keith, MacDuff, Portgordon, Portknockie, Portsoy, Tomintoul and Whitehills, so that a County-wide sample was obtained. Fluoride analysis of the water supply in the whole County was carried out by the analyst of the County Council of Aberdeen in 1969, and showed that the highest figure was 0.10p.p.m. in the town of MacDuff.

2.3 The Need for Sampling

It was apparent at the beginning of the study that it would be impossible to examine every fourteen-year-old child in the Paisley area, owing to the large numbers that this would involve, and to the considerable time this would take. A sample population was studied in this area, and the total available Banff population was examined.

5.3 SAMPLING

No special pilot studies were undertaken, nor was any dentist, doctor or health specialist consulted, since it was felt that the population being examined needed no other identification or stratification other than that of "fourteen-year-old school children". However, only state schools were selected and no schools for the handicapped, orphaned, or delinquent children

5.3/ were included in the survey. The age group was defined by supplying to each school, two dates of birth that ensured that the children seen at the time of the examination would be fourteen-years-old.

e.g. Examination period - May 1970.
Dates of birth supplied -1.6.55. -
30.4.56.

In the industrial area, where the number of children was larger than could be examined, a random third was selected to be interviewed and examined, by examining only those whose dates of birth lay in the first ten days of any month. In the industrial area this produced about 550 children, and over the three annual examinations 1544 children were examined. A sample population of this size increases the validity of the results. In the Rural area, 640 children were examined.

5.4 METHODS

4.1 Itinerary

In each area, an itinerary was planned, that avoided examining at the same school before and after the lunch break, thus hoping to avoid an artificial improvement in the oral hygiene by children anticipating examination. Visits to school were not announced to the children beforehand.

5.4.2 The Examination

The examinations were carried out in a mobile survey unit. The subjects were examined on a horizontal examination couch as described by Slack (1961) (51). Before entering the unit each subject was interviewed individually by a non-dental person who completed a social questionnaire on one side of the proforma. Father's occupation was asked at this stage and the social class of the child, and the family background were determined by the Registrar-General's classification. The dental examination was recorded on the proforma by an assistant, and on tape simultaneously. Any points that were missed were completed from the tape recording.

4.3 The Examiners

The author was assisted in the examinations by a co-examiner (K.W.S.). Each examiner saw a similar number of subjects throughout the whole survey. This reduced the workload on each examiner, increasing his efficiency and hence this resulted in minimum disturbance to school routine. Examiner variability was tested and is recorded and discussed in Chapter 7.

4.4 The Proforma

The Proforma is illustrated in Figure 8.

EXAMINATION

Examiner _____ Dentures

8 7 6 5 4 3 2 1 | 1 2 3 4 5 6 7 8

Oral Hygiene

		Ant.		Total
Upper				
Lower				
Total				

O.H. Index

Teeth lost apart from caries

M.

A.

Tr.

Calculus Total Index

Russell Index.

Fractured Incisors

Tooth	E.	D.	P.

Interproximal Contact.

	Crowding	Spacing
UR.		
UA.		
UL.		
LR.		
LA.		
LL.		

Does patient need immediate treatment?

0 1 2 3 4 5 6 7

SUMMARY

Teeth decayed

Teeth missing D.M.F. Teeth

Teeth filled D.M.F. Surfaces

SERIAL NO.____ (1 - 3) NAME _____ SEX_____(4)

ADDRESS_____ DATE OF EXAMINATION

SCHOOL _____ DATE OF BIRTH

CLASS _____ AGE _____ (5)

FATHER'S OCCUPATION

1. HAVE YOU ALWAYS LIVED IN THIS AREA? Yes 1 No 0 (6)
   (YES, if never away for longer than six months at a time).
2. DO YOU HAVE A TOOTHBRUSH? Yes 1 No 0 (7)
3. HOW OFTEN DO YOU BRUSH YOUR TEETH?
   ___ times/day (1 2 3)
   ___ times/week (5/6 (4) 3/4 (5) 1/2 (6))
   ___ (Rarely) R (0) (8)
4. HAVE YOU BRUSHED YOUR TEETH IN PAST 24 HOURS? Yes 1 No 0 (9)
5. HAVE YOU EATEN SINCE YOU LAST BRUSHED YOUR TEETH? Yes 1 No 0 (10)
6. AMOUNT SPENT ON SWEETS IN PAST WEEK ___ S d (11)
7. DO YOU EAT SNACKS ? Yes 1 No 0 (12)
8. WHAT TYPE ? Cho 1 Non 0 (13)
9. NUMBER PER DAY 0 1 2 3 4 (14)
10. DO YOU HAVE A DENTIST? Yes 1 No 0 (15)
11. DO YOU ATTEND A DENTIST REGULARLY? Yes 1 No 0 (16)

NAME OF PATIENT'S DENTIST (if known)

_____

_____

_____

Figure 8

CHAPTER 6. THE DENTAL EXAMINATION: CHOICE OF INDICES AND CRITERIA.

6.1 THE ORAL HEALTH INDEX

In selecting an index for the assessment of any factor of oral health, the epidemiologist must consider the following criteria if he wishes to avoid, or anticipate, difficulties during the planning, examining, or reporting stage of a dental health survey.

"The index must be one that is reproducible, simple, employable as a measuring device, and one which permits planning with confidence. The most useful index is one which when employed in the appropriate situation by the appropriate person easily can be subjected to statistical tests for validity and reliability." (52)

6.2 DENTAL CARIES

2.1 Definition

Dental caries is defined as a localised, post-eruptive, pathological process of external origin involving softening of the hard tooth tissue and proceeding to the formation of a cavity. (W.H.O. 1962) (53).

2.2 Methods

In "Oral Health Surveys" (W.H.O. 1971) (54) it is stated that the "examination for caries should be conducted with a plane mouth mirror and a reasonably sharp explorer or probe, in good light (avoid direct sunlight). Use of radiographs is not recommended because of the impracticability of using them in all situations and the limited value of the additional

6.2.2/ data they would yield in surveys of this type."

These conditions for examination were met in this study, and the probe used was one with replaceable sickle heads (Miller and Atkinson 1951) (55). The probe points were changed at every 4 examinations. The examination commenced by charting all teeth, and those missing from the arch were assessed as unerupted, extracted for malocclusion, lost through trauma, congenitally absent, or extracted for caries or its consequences. Full mouth recording was used and not the partial mouth recording as recommended by W.H.O. (1971).

2.3 Indices Used in this Survey

The DMF Index of Klein, Palmer and Knutson (1938) (56) was used in this study. It has been criticised as inaccurate in that there are other reasons for tooth loss, and that tooth loss from periodontal disease produces increasing inaccuracy in the Index as the subjects get older. In this study only teeth lost from caries were included in the DMF count. The DMF Index is the best index of caries experience, and is well suited to this study. It does not however give an indication of intensity of caries attack since a tooth with caries occlusally and mesially and distally is just one increment in the DMF Index. Therefore the DMF Surfaces Index was also used in this survey to give a more detailed account of the caries involvement.

6.2.3/ In addition, to assess the caries involvement of each tooth the Penetration Scores of McHugh et al (1964) (5) was also used, viz.

Score 1. "Sticky Fissures".

Score 2. Fissure or free surface cavity with softness at base and staining or opacity of enamel.

Score 3. Obvious dentine involvement (including all visible interproximal cavities).

Score 4. Obvious pulp involvement.

Only the largest cavity in each tooth was scored as the penetration score for that tooth. This index was used in order that the data obtained would be comparable with that published by McHugh et al from Dundee, but, principally, to assess the caries treatment requirements.

The interpretation of "sticky fissure" has been a subject of controversy for years. Slack et al (1958) (57) suggests that observations in this category without evidence of caries should not be included in a caries score, as this will reduce examiner error. However, Parfitt (1954) (58), and Miller and Hobson (1956) (59), show that nearly all "sticky fissure" are carious. McHugh et al (1964) (5) states that Penetration Scores have not been used to any great

6.2.3/ extent in epidemiological studies of caries. They do, however, provide valuable information on the extent of caries and particularly on the treatment required.

6.3 PERIODONTAL DISEASES

3.1 Definition

Periodontal diseases are those pathological processes of an inflammatory type that involve the periodontium. They are generally characterised clinically by gingivitis, pocket formation, loss of alveolar bone, and eventually, loss of teeth. (W.H.O. 1962) (53). In this study of children, diagnosis of periodonitis (a true pocket) was rare, and this is reflected in the results of the periodontal examination.

3.2 The Difficulties of Measuring Periodontal Disease

Measuring periodontal disease is a much more difficult problem than measuring caries. Before attempting to measure the disease, the investigator must first have a clear understanding of his objectives. The clinician wishing to evaluate the effect of a clinical technique in restoring a diseased periodontium to health, will be interested in a valid, reliable assessment of gingivitis and depth of pockets before and after his treatment. The position of the bone is of little interest to him, epidemiologically, since it can be assumed that this will not change markedly as a result of his treatment. The epidemiologist is also interested in a valid, reliable method, but wishes

6.3.2/ it to be quick and reproducible since he is screening large numbers of subjects to obtain a prevalence rate for the community under observation. He must be quite sure that what he calls disease is really disease. Again, the clinician may wish to record a measurement for every tooth in the mouth, whereas the epidemiologist may be satisfied with a partial mouth recording. Thus, before investigating the measuring sticks at our disposal we have to consider whether to use a reversible index or an irreversible index (i.e. does it revert to zero with treatment?) and whether to do a partial or full mouth recording. The investigator must also consider how much time he has available to examine the periodontium.

Whatever the case, the most careful calibration is essential. Even one examiner may disagree with himself on separate assessments of the same situation, and therefore it is wishful thinking to expect exact agreement between two examiners. The trained periodontist will score higher than his non-periodontal colleague, and will have a tendency to apply his own skill, and thus must be careful to 'stick to the rules.' As in most epidemiological studies, when measuring periodontal destruction, when in doubt, assign the lower score.

There is little doubt that accurate assessment of periodontal destruction (pocketing) needs the use of a

6.3.2/ periodontal probe. Some indices are designed for occasional use of a probe. Deciding to use the periodontal probe can be a problem, and it is not often written into the criteria. It would be simple if every index was designed to allow the examiner to test every part of every gingival margin for the presence of pocketing. This is of course very time-consuming, being more of a careful clinical examination, rather than a quick epidemiological method. The more soft tissue examination undertaken, the more the problem of sterilization of instruments in the field is raised. Measurement using a probe must be done with the head of the instrument parallel to the long axis of the tooth. In the papillary area this can give rise to falsely high readings due to the badly trained examiner including the height of the papilla in his estimation.

If every part of the gingival margin is not to be examined, the specific instruction must be given to test one area, say, the mesio-facial line angle, or to test for pockets only where an area of gingivitis has already been defined.

Of more specific relevance to the present study, is the design of accurate criteria for the recognition of gingivitis. Many of the indices in use today are very vague in their instructions to the examiner as to the recognition of gingivitis. Phrases such as

6.3.2/ "obvious inflammation", and "an area of redness" are subjective since every dentist will have his own interpretation of these instructions. Most indices of periodontal health include gingivitis and periodontal destruction, but there are several methods of measuring gingivitis alone. The P.M.A. Index of Schour and Massler (1947) (60) was possibly the first successful attempt to design a numerical system for the measurement of gingivitis. The letters signify Papillary (P), Marginal (M), and Attached gingivae (A), and the letter was assigned to the examination chart if inflammation was positive in that area. In addition, the severity was indicated on a scale 0 to 4. One of the criticisms of this system is that a severe inflammation should not be weighed four times as heavily as a mild gingivitis. It is also difficult to calibrate examiners to assign scores accurately. The original index has been modified several times since its inception. It has also been used with standardised clinical photographs. A measurement of plaque level has been used as a measurement of gingivitis, since the relationship between plaque level and gingival inflammation has been shown to be linear.

3.3 Periodontal Indices

The following are some of the Periodontal Disease indices that include gingivitis and destructive periodontal disease, and are in common use.

6.3.3.1 The Periodontal Index (Russell 1956) (61)

This index, perhaps the most widely used, was the first to insist that the examiner should follow dogmatically the rules laid down. The criteria for this index are as follows:

Score	Criteria
0	Negative There is neither overt inflammation in the investing tissues nor loss of function due to destruction of the supporting tissues.
1	Mild Gingivitis There is an overt area of inflammation in the free gingivae, but this area does not circumscribe the tooth.
2	Gingivitis Inflammation completely circumscribes the tooth, but there is no apparent break in the epithelial attachment.
6	Gingivitis with Pocket Formation The epithelial attachment has been broken and there is a pocket (not merely a deepened gingival crevice due to swelling in the free gingivae). There is no interference with normal masticatory function: the tooth is firm in its socket, and has not drifted.

6.3.3.1/ Score	Criteria
8	Advanced Destruction with Loss of Masticatory Function The tooth may be loose; may have drifted; may sound dull on percussion with metallic instrument; may be depressible in its socket.

This index is heavily weighted to the destructive phase of the disease, a very severe gingivitis (2) being given no more than one third the weight of a true pocket (6). It does not however, differentiate between an early pocket and one with its base at the apex, in a firm tooth, e.g. a single pocket on a multi-rooted tooth. The Periodontal Index does not use routine probing of pockets. In fact, the author states that the mouth mirror is supplemented occasionally by a straight Jaquette scaler or chip blower for demonstration of a pocket. Because of this fact, and despite its heavy weighting, the Periodontal Index may underestimate the severity of destructive periodontal disease. The method is quick and fairly reproducible and has been used in many studies, always a good point for comparison. Some recent research has considerably improved the scope and reliability of this index(Sheiham and Striffler) (1970) (65).

6.3.3.2 The Periodontal Disease Index (Ramjford, 1959) (62) is a partial mouth index using six specified teeth. Gingivitis is scored on a scale 0 - 3 but is disregarded where there is a true pocket. Measurements are taken from each surface of these teeth. However two other groups of workers have since found that the mesial surface of the tooth can be accurately taken as representative of the tooth, and this considerably reduces the time factor. (63, 64). It is a time-consuming method involving measurement of distance from the gingival margin to the cemento-enamel junction (CEJ), and to the bottom of the pocket from the gingival margin. These are added or subtracted to arrive at a tooth score for a measurement of bone loss. This assumes that the alveolar bone crest is immediately below the bottom of the pocket, and that the point of reference for healthy bone is at the CEJ. These are both valid assumptions within one millimetre. The weighting system devised by Ramfjord is as follows:-

If the gingival crevice extends apically
to CEJ by - 0-3mm = 4
3-6mm = 5
over 6mm = 6

If there is a score of 4, 5, or 6 assigned then the score assigned for gingivitis is disregarded. Some doubt has been raised about this weighting system.

6.3.3.2/ Is a 6mm pocket (scored as 6) not more than twice as severe as a severe gingivitis (which would score 3)? The periodontal part of this index is irreversible since the measurement calculated from the CEJ to the base of the pocket will never resort to zero, as a consequence of successful treatment. This is a very accurate index, but it is a long method, both in application and in preparation, since the subject may have to have calculus removed to locate the CEJ. As we will see later Sheihan and Striffler (1970) (65) have modified the index in a comparison with Russell's Periodontal Index.

3.3 Radiographs

The use of radiographs for estimating destruction of alveolar bone loss is obviously very attractive, but a separate method has to be adopted for gingivitis. It is however, an irreversible method and returns the same results irrespective of the presence of severe inflammation, or healthy gingival margin (as a result of gingivectomy). Again the CEJ is the landmark of importance, and health exists when the alveolar crest is one millimetre or closer to the CEJ. There are many methods of estimating destruction, but there are also many difficulties to be overcome such as the standardisation of equipment and angulation. Also, the inevitable overlap of teeth on the radiograph, and the variation of the bone level

6.3.3.3/ around one tooth can cause problems. The index is calculated by dividing the sum of the tooth scores by the number of teeth.

3.4 A Combination Index

It was stated above that the Russell's Periodontal Index (P.I.) has been found to under-record the severity of destruction. Sheiham and Striffler (1970) (65) have successfully worked out a graph and conversion factor to convert a P.I. value to a value more representative of a detailed clinical examination. To do this they compared P.I. values obtained from a New Mexican Population with a combined measurement referred to as MXPDI. This measurement was derived from a measurement by radiograph, a modified Ramfjord's Index, and a mobility measurement.

The result of this was a graph and conversion factor to convert P.I. to a more realistic value (65).

A problem in the measurement of periodontal destruction, especially with the P.I., is the tooth showing evidence of recession. The gingival margin is often free from inflammation, and there is no pocket. (Ramfjord's Index picks up these cases because it is measuring the amount of bone lost).

3.5 The Gingival Recession Index computes the number of teeth with an exposed CEJ, expressed as a percentage

6.3.3.5/ of the number of teeth present. It is a quick method, and is easy to calibrate, but it is not very accurate. It records recession due to tooth-brush abrasion, normally regarded as healthy.

Two more indices are worthy of attention. The first was devised by O'Leary in 1963 for use in a military dental service.

3.6 The Periodontal Screening Examination (67)

For reasons of time available and calibration the examination for pockets is confined to a position corresponding to the mesio-facial line angle. To permit the clinician, for whom this index was designed, to localise areas requiring treatment, the mouth is divided into six segments. The criteria are particularly well defined especially those relating to gingivitis. The highest score for any one of the teeth in a segment is recorded as the score for that segment. The gingivae are scored 0, 1, 2 or 3, and the periodontal tissues are scored 0, 4, 5 or 6.

3.7 McPhee (1967) (68) has published a scoring system which has been adopted by the Scottish Dental Estimates Board. This system, which is an irreversible index, is based on Russell's index, but has been redesigned so that each stage, including the gingivitis scores, is allied to an outline of treatment.

6.3.4 The Choice for this Survey

In this Survey, Russell's Periodontal Index was used, despite the disadvantages listed above, because

1. It is a quick, fairly reliable method of screening large numbers of subjects.
2. Other studies of a similar age group have used this index.
3. It was expected that the large bulk of the clinical material would consist of gingivitis, and other indices which are considered as better than the Periodontal Index are improved in their measurement of destructive phases of the disease.

Sheiham and Stiffler's conversion factor was not used since, at this low end of the Periodontal Index, mobility and radiograph measurements should be zero, and this would mean that the comparison would be between Russell's and Ramfjord's Index.

6.4 MEASUREMENT OF ORAL HYGIENE

In retrospect, the method of measuring oral hygiene that was chosen, is seen as a departure from normality. The method chosen was the "Dundee" Oral Hygiene Index (McHugh et al, 1964) (5) which was a modification of the Oral Hygiene Index of Greene and Vermillion (1964) (69). This method was chosen in order that the basic results from each survey area would be comparable with the results from the Dundee

6.4/ area, which was the only similar study in Scotland.

The method is as follows. Each jaw is divided into two posterior and one anterior segments, and each of the six segments of the mouth is scored on the basis of the worst tooth in the segment. One measurement was made for buccal and one for lingual in each segment.

Scoring

0 - No debris.

1 - Interproximal debris.

2 - Up to 1/3 of buccal/lingual surface covered.

3 - More than 1/3 of buccal/lingual surface covered.

Debris was detected by drawing a probe over the tooth surface. The twelve scores were added up and divided by three, giving a range from zero (no debris on any tooth) to 12 (debris covering more than 1/3rd of the buccal and lingual surface of at least one tooth per segment).

6.5 MEASUREMENT OF CALCULUS

The simplified Index of Greene and Vermillion (1964) (69) was chosen. The following were the values allotted:

6.5/

0 - No calculus.

1 - Supragingival calculus covering not more than one-third of the exposed tooth surface.

2 - Supragingival calculus covering one-third to two-thirds of the exposed tooth surface, or small flecks of sub-gingival calculus.

3 - Supragingival calculus over two-thirds of the exposed surface, or a continuous heavy band of sub-gingival calculus.

The tooth surfaces examined were: 1/ and /1 labial; 6/6 lingual; 6/6 buccal. If any of these teeth were missing or partially erupted, then the adjacent tooth of similar morphology was scored.

6.6 OBSERVATION OF CROWDING AND SPACING

This was recorded on the examination chart, and the criteria were designed on the basis of the ability of a crowded jaw to retain plaque. The mouth was divided into six segments for this examination but an analysis of the data by segment is not presented in this report.

CROWDING in each segment is positive where one or more teeth have been wholly or partly forced out of

6.6/ the line of the dental arch, and are estimated to be in a position which will encourage the retention of bacterial plaque.

SPACING in each segment is positive where either one or both proximal contacts is absent, thereby promoting self cleansing areas.

This is an arbitrary assessment and there are obvious weaknesses in the criteria. The results will be presented in relation to the need for orthodontic treatment.

6.7 ESTIMATION OF TREATMENT REQUIREMENTS

On the basis of the foregoing dental examination, an estimation was made of the treatment required to render a subject dentally healthy. The following are the criteria:-

1. No treatment required

No cavities, or only cavities of penetration score 1 ("sticky fissure"); only isolated areas of bacterial plaque equivalent to a normal daily level; transient gingival inflammation (occasional "Code 1" score allowable); no calculus.

2. Oral Hygiene Instruction only

Bacterial plaque exceeding that stated in category 1), but no calculus.

6.7/ 3. Conservation and Oral Hygiene Instruction only

Cavities of penetration score 2 and 3 and oral debris exceeding that stated in category 1), but no calculus.

4. Conservative Treatment

Cavities of Penetration Score 2 or 3.

5. Periodontal Treatment

Several teeth recorded as Periodontal Index value 1; a recorded Periodontal Index of 2 for one or more teeth; calculus.

6. Extractions

Cavities of penetration score 4 (Pulpal involvement).

7. Part Dentures

To increase masticatory efficiency; to replace several teeth requiring extraction; aesthetics; to replace badly fitting denture.

8. Full Dentures

Where a mouth was impossible to restore.

9. Orthodontic Treatment

A compilation of those thought to require prophylactic orthodontic extractions, orthodontic extractions and further treatment (appliance therapy) or those whose mouth was thought to require the opinion of a Consultant Orthodontist.

It should be noted that Categories 1, 2 and 3

6.7/ are mutually exclusive. A child was placed in <u>one</u> of these categories, or in one, or several of the other categories.

CHAPTER 7. THE RELIABILITY OF THE EXAMINERS

7 THE RELIABILITY OF THE EXAMINERS

In an epidemiological study, the validity of the results depends on the variation between examiners. Where this variation is great, any expression of the results of each examiner in a combined form will be inaccurate. It is, however, very unlikely that any two dental epidemiologists will ever agree precisely with each other, but it is important that the variation should be minimal, and that it should be known.

7.1 THE IDEAL ORGANISATION OF THE PRE-SURVEY PERIOD

A specific period of training and calibration should precede the fieldwork. During the training period, differences of opinion may arise between the examiners who are being trained, and hence it is wise that the training period be supervised by an experienced epidemiological examiner. The subjects who are recruited to act as volunteer patients should be as representative of the proposed survey population as is possible e.g. dental students would be a poor choice, particularly in the case of the present survey, since they are a different age, and most likely have a better standard of dental health.

7.2 ADMINISTRATIVE DIFFICULTIES ENCOUNTERED IN THIS SURVEY

The dental examinations in this study were carried out by two examiners (D.A.S. and K.W.S.). Each of these examiners saw 50% of the subjects. The first fieldwork period, which took place in Paisley in 1968,

7.2/ had to be undertaken at relatively short notice, since it was being carried out as an epidemiological service, and not, in the first instance, as a basic research project. For this reason the author, and his co-examiner, were not able to undertake a planned training and calibration programme, as they had desired. Furthermore, suitable volunteer subjects for a training programme are not easy to arrange when the project is dealing with school-age persons. The only possibility would have been to plan a preliminary visit to the survey area, and ask for a further period of access to certain school classes.

Since it was desired to proceed as quickly as possible, and with a minimal number of disturbances at each school an alternative plan was devised.

7.3 AN ALTERNATIVE PLAN FOR TRAINING AND CALIBRATION

The criteria for the dental examinations were based on those used in a previous survey in which the author and his co-examiner were involved. However certain amendments and additions were required, and when these were completed, the examiners were familiar with the criteria. At the start of each fieldwork period, both examiners were present. One examined while the other observed, in rotation. Collaborative decisions were made, and short discussions were held over various points of apparent difference. This continued until agreement was attained. This required

7.3/ about 40 examinations in the first instance, and reduced in number with each subsequent fieldwork period.

To provide data for calibration, 20-30 subjects were re-examined independently by the other examiner, towards the end of each fieldwork period. This produced a total of 101 children who had been seen by both examiners over the three year period. It is on this number of subjects that the following calibration data is based.

7.4 EXAMINER VARIABILITY

The difference between examiners has been tested on the following parts of the examination technique.

Penetration Score for Caries
Decayed Teeth
D.M.F. Teeth
"Dundee" Oral Hygiene Index
Calculus Index
Periodontal Index

All statistical testing has been done using Student's "t" test.

4.1 Penetration Score for Caries

Analysis of the examiners' ability to be consistent on the estimation of Penetration Score is necessary since this measurement was used to allocate a subject to a treatment category related to caries. Score 2

7.4.1/ and 3 cavities allocated a child to one of the "Fillings" categories and Score 4 allocated a child to the Extractions category.

The following table shows the result of the analysis.

Score	Examiner	Mean	Sign. Diff.	"p" value
1	D.A.S. K.W.S.	1.80 1.98	NO	-
2	D.A.S. K.W.S.	1.41 1.64	YES	<0.01
3	D.A.S. K.W.S.	3.15 2.67	YES	<0.01
4	D.A.S. K.W.S.	0.68 0.64	NO	-

There is a significant difference between the examiners in Score 2 and 3. For this reason, these results are not analysed in this report. Chapter 6 stated the criteria for the Penetration Score. Grade 3 was defined as "obvious dentine involvement, including all visible interproximal lesions". It can be seen from the above table that one examiner (D.A.S.) scored high in Grade 3, but low in Grade 2, as compared with the other examiner (K.W.S.). This will affect the number of D.M.F. Surfaces recorded, and, consequently, the D.M.F. Surface Index is not discussed in this report.

7.4.1/ The examiners do agree on the numbers of teeth not requiring fillings (Grade 1) and on the numbers of teeth needing extraction (Grade 4). Despite the previously noted descrepancies, there will, therefore, be agreement about the number of teeth requiring filling, (Grade 2 and 3 combined). The following section provides corroborative evidence of the overall agreement on carious teeth.

4.2 Decayed Teeth

The following table shows the result of the analysis.

Examiner	Mean	Sign. Diff.	"p" value
D.A.S. K.W.S.	7.10 6.94	NO	-

The examiners were in agreement about the mean total number of decayed teeth present per child.

4.3 D.M.F. Teeth

The following table shows the result of the analysis.

Examiner	Mean	Sign. Diff.	"p" value
D.A.S. K.W.S.	10.93 11.04	NO	-

7.4.3/ The examiners were in agreement about the mean number of D.M.F. Teeth per child. Since this has also been shown for Decayed Teeth, it can be safely assumed that the examiners were equally accurate in recording Missing and Filled teeth.

7.4.4 "Dundee" Oral Hygiene Index

The following table shows the result of the analysis.

Examiner	Mean	Sign. Diff.	"p" value
D.A.S. K.W.S.	4.82 6.13	YES	<0.001

This table shows a highly significant difference between examiners in the measurement of plaque levels. This difference cannot be totally ignored, but there are considerable difficulties in calibrating the measurement of plaque levels. The main problem is to ensure that the same amount of plaque is present on a subject's teeth when a second examiner takes his measurement immediately after the first examiner. To allow the plaque to remain undisturbed by both examiners restricts the full application of the criteria i.e. neither examiner can use a probe. In this survey, the first examination was used as data, and the second for calibration. Thus, the first examiner HAD to use the probe. This could explain the

7.4.4/ difference between examiners if it could be stated that one examiner (K.W.S.) was always the first examiner during these calibration sessions. (K.W.S. recorded the higher mean value of the Index) Unfortunately, this is most unlikely. Thus, some discrepancy exists between examiners in the recording of the Oral Hygiene Index, but the combined results of both examiners are used in this report. Therefore, where a mean value of the "Dundee" Oral Hygiene Index is quoted, it must be regarded as a less accurate reflection of the true status in the sample than most other results. This applies to Chapter 9, mainly, where the basic findings in each area are reported. In other chapters, the mean values of the Oral Hygiene Index are used to test the effect of other variables, and since the difference between examiners is a consistent finding, the relative effects of other variables that are described will be unaffected. Neither examiner recorded a subject who was completely plaque-free, including the interproximal areas.

7.4.5 Calculus Index

The following table shows the results of the analysis.

Examiner	Mean	Sign. Diff.	"p" value
D.A.S. K.W.S.	0.35 0.36	NO	-

7.4.5/ There was no significant difference between examiners in the recording of calculus.

4.6 Periodontal Index

The following table shows the results of the analysis.

Examiner	Mean	Sign. Diff.	"p" value
D.A.S. K.W.S.	0.78 0.94	YES	<0.02

There was slight disagreement between examiners in the recording of gingivitis. This, in retrospect, was felt to be due to the difficulty of interpretation of the word "inflammation" in the criteria for Codes 1 and 2 of Russell's Periodontal Index. The difficulties of measuring Periodontal Disease were discussed in Chapter 6. The values for the Periodontal Index quoted in the results are the combined examiners results, and consequently, slight reservations should be attached to their accuracy. Variation in Periodontal Index value due to other variables will be unaffected by this inconsistency between examiners.

7.5 CONCLUSIONS

It is regretted that the method of training and calibration of examiners used in this survey is not the one of choice. An initial period, prior to commencing the fieldwork, should have been allocated for training and for calibration. In a more recent

7.5/ Scottish survey of Adult Dental Health, the author and his co-examiner were responsible for the training and calibration of 24 dental examiners, and this was undertaken as outlined in paragraph 7.1.

The considerable agreement which has been demonstrated between examiners, in this chapter, owes a lot to luck. Had these results shown total disagreement, then this survey report could not have been produced. The only alternative would have been to use the results of one examiner, and even then, it would have been impossible to select the most accurate of the two examiners.

The agreement which has been demonstrated in this chapter justifies the use of the combined examiners results throughout this report. A single reservation is made; in Chapter 9 where the basic findings are reported, the recorded level of oral hygiene, and of gingivitis and periodontal disease may suffer from examiner error. Elsewhere, the effect of other variables on these two measurements will be un-affected.

CHAPTER 8. PROCESSING AND STATISTICAL ANALYSIS OF DATA

8.1 DATA PROCESSING

The information recorded on the proforma was coded and then transferred to I.C.T. 80 column cards. The information was produced in the form of frequency distributions by a standard epidemiology computer programme at the National Engineering Laboratories, East Kilbride, with the grateful help of the Computing Service, University of Glasgow. The further analysis of the data was carried out by the author and a data processor, on a Hewlett-Packard 9100A Desk-Top Computer in Glasgow Dental Hospital and School.

8.2 DATA ANALYSIS

Where relevant, the frequency distributions were reduced to a mean value, and a standard deviation of the mean. Statistical analysis of differences between means, in any comparison, was completed using Student's "t" test. Where the results were expressed in numbers of subjects, rather than mean values, the analysis was by the chi-square 2 x 2 contingency table. Examples of these techniques follow.

8.3 EXAMPLES OF ANALYSIS

EXAMPLE 1

Table 5 (Mean Amount Spent on Sweets per Week)

URBAN (1) Males: mean.....14.50
standard deviation.... 9.00
number.....713

8.3/ (2) Females: mean.....11.62
standard deviation.... 8.18
number.....831

$$t = \frac{mean_1 - mean_2}{\sqrt{\frac{sd_1^2}{n_1} + \frac{sd_2^2}{n_2}}}$$

$$= 6.5448$$

Reference to the Statistical Tables (Fisher and Yates) (70) shows that, at degrees of freedom ∞ this value of "t" produces a probability of less than 1:1000

$$\text{i.e. } p < 0.001$$

This is interpreted to mean that the difference shown in mean values between Urban male and female samples in Table 5 could be reproduced by chance once in one thousand investigations, and thus a difference of this magnitude can be assumed to be present between the sample populations, and probably in the total population from which the sample was drawn.

8.3/ EXAMPLE 2

Table 17 (Percentage of Children Requiring Treatment)

	Rural	Urban
Conservative Treatment Required	357 (55.78%)	543 (35.10%)
Total Pop.	640 (100%)	1544 (100%)

Data of the above nature was analysed using the chi-square 2 x 2 contingency table. Analysis was done for each category, instead of using the standard chi-square analysis which calculates the expected results, compares these with the observed results, and expresses any significant difference in relation to the distribution of results in general.

In the example quoted above, a null hypothesis is established. This infers that there is no relationship whatsoever, between those requiring conservative treatment in the Urban and Rural areas. This null hypothesis is substantiated or rejected as follows:-

(N.B. Typographically X^2 = chi-squared)

8.3/ Observed Results

	1	11	TOTALS
Rural	(a) 357	(b) 283	(a + b) 640
Urban	(c) 543	(d)1001	(c + d) 1544

$$X^2 = \frac{(ad - bc)^2 \ (a + b + c + d)}{(a + b)(c + d) \ (a + c)(b + d)}$$

$$= 79.3503$$

Reference to the Statistical Tables (there is only one degree of freedom with this method) shows that this value of X^2 produces a probability level of less than one in a thousand.

i.e. $p < 0.001$

This is interpreted to mean that the null hypothesis is highly unlikely to stand as defined, and that there is a relationship established between these Urban and Rural figures. The relationship is that a higher percentage of Rural children need Conservative Treatment.

8.3/ EXAMPLE 3

Table 18B (Social Class and Dental Habits in Rural Area)

	Social Class 1V	Total Pop.
Do you attend the Dentist regularly: Yes	30 (31.91%)	259 (53.62%)
Total Pop.	94	483

The null hypothesis in this case is that there is no relationship between the numbers in Social Class 1V and those not in Social Class 1V in the two groups: 1) attending a dentist regularly, 2) the total sample population. i.e. a dental habit or attitude is not related to the distribution of a population by social class.

Observed Results

	1	11	TOTALS
Attend dentist regularly.	(a) 30	(b) 229	259
Remainder of Population.	(c) 64	(d) 254	318

$$X^2 = \frac{(ad - bc)\quad (a+b+c+d)}{(a+b)(c+d)(a+c)(b+d)}$$

$$= 7.6388$$

8.3/ From the Statistical Tables it is seen that the level of probability is as follows:-

$$0.001 < p < 0.01$$

Thus, the null hypothesis is rejected, and since there is a lower percentage of people in Social Class 1V in the category "Do you attend the dentist regularly? Yes." (31.91%) than in the total population (53.62%), it is postulated that Social Class 1V children (Rural) are less likely to attend the dentist regularly. Table 18B shows that Class 1V is the only Social Class to show a relationship with regular attendance. In the other social classes, the percentage distribution of "Yes" and "No" answers to the questions about regular dental attendance is the same as the percentage distribution in the total sample, i.e. with the exception of Social Class 1V, there is no relationship between social class and regular dental attendance.

CHAPTER 9. COMPARISON OF THE BASIC RESULTS OBTAINED IN THE URBAN AND RURAL AREAS.

9.1 SOCIAL DATA

1.1 The Sample Populations

Table 1 shows the number of children examined in each area. The 640 Banff (Rural) subjects represented 85% of the total number of 14-year-old children in the County. 15% of this age group were absent from school over the period of the Survey. The 1544 Paisley (Urban) subjects were examined over a period of three years, in groups of approximately 500 subjects each. Each year 1/3rd of the available 14-year-old population was examined, the selection being made as previously described. The sample has produced slightly more males than females in Banff, and slightly more females than males in Paisley.

Table 2 shows the distribution of the sample by social class, according to the occupation of the subject's father. In the Rural area 13.91%, and in the Urban area 16.45% of the subjects could not be classified because the father's occupation was not known or was not applicable in that the father was retired, unemployed, or deceased. The Rural data is compared with the 1966 census (10% sample) results for Banff County (all males). The distribution of the sample for this study does not show good correlation with the 1966 Census figures. It is over-represented in Social Class III, and considerably under-represented in Social Class IV. It is also

9.1.1/ under-represented in Social Class V, particularly in male children. The Urban figures are compared with the 1966 Census (10% sample) for the Central Clydeside Connurbation and show a much closer similarity in distribution. The smaller size of the Rural sample may account for the different distributions obtained. The bottom line of Table 2 shows to what per-cent the sample figures diverge from the 1966 Census results.

1.2 Toothbrushing Habits

Table 3 shows the percentage of children who claimed to own a toothbrush. When asked a question of this nature it is inevitable that some children will respond with a false positive reply. However, if a child replies that he does not own a toothbrush then it is fairly certain that this is a true response. In the Rural area 100%, and in the Urban area 99.40% of females claimed to own a toothbrush. In both areas a similar percentage of males claimed to own a toothbrush. In fact the results are remarkably similar in both areas. Statistical analysis reveals that there is a positive relationship between the percentage of boys and girls who claim to own a brush (X^2 test $p < 0.001$). The subjects were asked how often they brushed their teeth. The responses shown in Table 4 show that in the Rural area once per day was the most common stated frequency, whereas in the Urban area twice per day was most common. The category

9.1.2/ "less than once per day" is derived from those answering "X" times per week" and "rarely". Statistical analysis was carried out using the X^2 method described. A null hypothesis that there is no relationship at all between the factors being tested was set up for each brushing frequency including "no brush". When the total populations were tested, it was found that the null hypothesis was rejected at "1/Day" ($p<0.02$) and 2/Day" and "less than 1/Day" ($p<0.001$). Thus the fact that, in the Urban area, a smaller percentage of children brush "1/Day" and "less than 1/Day", and a larger number brush "2/Day" than in the Rural area would seem to be a characteristic of this area. By the same method of analysis, in each area the best brushing habits are shown to be consistently related to the female subjects (X^2 $p<0.001$). Similarly, males in the Rural area are less likely to brush "2/Day", and more likely to brush "less than 1/Day", than their Urban counterparts (X^2 $p<0.001$). More females in the Rural area brushed "1/Day" than in the Urban area, and less females in the Rural area brushed "2/Day" than in the Urban area (X^2 $p<0.001$). This is an interesting observation because the table shows that, in Rural females only, a larger percentage brushed twice per day. McHugh et al (1964) (5) found that the most commonly stated frequency of brushing among Dundee children was once per day (31%).

9.1.3 Spending on Confectionery

Table 5 shows the mean amount spent on sweets per week by the subjects examined. The responses to this question were graded in groups with an interval of 5p. In calculating the mean amount, all values over 25p were combined. In the Urban area, the children claimed to spend slightly less on sweets. The difference between the Urban and Rural totals was not significant when statistically tested. In both areas males spent more than females ("t" test $p < 0.001$) and a comparison between males in the Urban and Rural areas, and females in the Urban and Rural areas showed a significant difference ("t" test $p < 0.02$ (males) $p < 0.05$ (females). This table would indicate that children in an Urban setting will spend slightly less on sweets, despite the greater availability of confectionary shops in general and of mobile ships in the vicinity of the school. An analysis of the spending habits by social class is considered in a later chapter. Males will consistently spend more on sweets than females. It is possible that females are spending less on confectionary because they are more conscious of appearance, in terms of weight-gain and, perhaps, of dental health. McHugh et al (1964) (5) found that the Dundee sample spend an average of 3/0d (15p) and that this was equivalent to 17.5oz. of confectionery per week. By today's values the sample groups would, on average buy about 10 oz. (Rural) and

9.1.3/ 11 oz. (Urban) of confectionery per week.

1.4 Snack-eating Habits

Tables 6, 7 and 8 are concerned with the responses to questions concerning between-meal eating habits. In the Rural area 73.59%, and in the Urban area 87.24% of the sample populations admitted to eating snacks. Statistically, it was shown that the fact that more Urban children ate snacks than did Rural children was highly significant (X^2 analysis $p < 0.001$). A relationship was established between males and females in the Urban area (X^2 $p < 0.001$) but no relationship was proven in the Rural area. Why so many more female than male children in the Urban area should eat snacks is not clear, and tends to disprove their reduced spending on sweets. However Table 7 shows that this might be due to the fact that more Urban females eat non-carbohydrate snacks than any other group. Statistical analysis of the data in Table 7 proved that a strong relationship exists between the distribution of carbohydrate and non-carbohydrate snack-eaters in the total sample populations (X^2 $p < 0.001$). Thus it can be fairly assumed that, in a Rural area, a higher percentage of children will eat carbohydrate, rather than non-carbohydrate snacks.

Table 8 shows the mean number of snacks per day for each sample. Significance testing revealed that there was no significant difference between males and

9.1.4/ females in the one area, but a highly significant difference between the means of the total population, and between males in the Urban and Rural areas, and between the two female samples ("t" test $p < 0.001$ in all tests). This means that, in an Urban area, more males and females are liable to eat a larger number of snacks per day than in a Rural area.

9.2 DENTAL DATA

2.1 Caries experience

Tables 9, 10, 11 and 12 show the caries experience of the sample populations.

Table 9 shows the mean number of decayed teeth. These values are calculated excluding the penetration score 1, the "sticky fissure" grading. It is quite clear that the sticky fissure is a controversial subject among caries epidemiologists. Clinically healthy fissures can be recorded as carious, and many more early carious lesions are recorded as healthy. It is now well accepted that the "sticky fissure" is carious (Miller and Hobson 1956 (59), Parfitt 1954 (58)), but perhaps more caries is missed without the use of radiographs, as in this study, than are over-recorded by including "sticky fissures" in the carious category. In a field study of some 2,000 subjects the decision not to use radiographs, however lamentable it may be, is an easy one to take. The results will then show definite under-recording.

9.2.1/ Although sticky fissures were recorded in this study, they are not included in the analysis of number of teeth decayed. These results are then consistent with many other studies where no radiographs were used and where either a blunt probe was used, or "sticky fissures" were ignored. Table 9 shows that the Rural population had a mean number of 4.86 decayed teeth and that the Urban sample had a mean of 5.26. This was marginally significant on statistical analysis ("t" test $p < 0.05$). Comparison of the two female samples showed a significant difference ("t" test $p < 0.01$) and there was also a significant difference between the Rural sample males and females ("t" test $p < 0.02$). There are many factors involved in determining number of decayed teeth in a population, including presence or absence of fluoride in the water supply, eating habits, oral hygiene, education levels, and the availability of dental treatment. It is not the purpose of this study to present a detailed study of the factors influencing caries prevalence. The effect of diet has been markedly demonstrated by Gustafsson et al (1954) (6) in the classic Vipeholm study, and much attention is currently being given to various groups of streptococci which have been shown to produce animal caries, and strongly implicated in humans. Consistent with the relationships already established in the aetiology of caries, the Urban sample has the highest mean number of teeth decayed, and also of

9.2.1/ missing teeth (Table 10) and also spends the highest mean amount on confectionery and a larger percentage of the sample claim to be snack eaters. Against this, however, later tables will show that the Urban sample has a lower plaque level and gingival condition. This would be seen to be evidence to the contrary, but it is the microbial content of plaque, not quantity that is important in the cause of caries.

Table 10 shows the mean number of missing teeth. These teeth are missing because of caries, since supplementary information was obtained about the other reasons for tooth loss. There was a highly significant difference between the mean number for the Urban and Rural totals ("t" test $p < 0.001$). There was no significant difference between males and females in either area, but the two female samples showed a highly significant difference ("t" test $p < 0.001$) and the males sample a significant difference ("t" test $p < 0.02$). It would seem from Tables 9 and 10 that Rural children show less evidence of caries, but it would also point to a greater difference in dental treatment. Dental treatment is certainly more available in the Urban area, but in the Rural area, the child is probably seen more regularly by the local authority school dental service, and these figures could also indicate that carious teeth were being saved more effectively by a service that brings dental treatment to the child.

9.2.1/ Table 11 again seems to confirm this impression, since the Rural area shows a larger mean number of filled teeth ("t" test $p<0.001$). This trend was repeated when the two male samples were compared ("t" test $p<0.001$). Both samples showed that females had more filled teeth than males ("t" test $p<0.001$ in both cases).

Table 12 shows the mean number of D.M.F. teeth. This is a cumulative measure of caries experience. The figures show that the Rural area has a higher mean D.M.F. value of 11.47. This is significantly higher than the Urban figure of 10.99 ("t" test $p<0.05$). This means that the Rural area has a higher caries experience than the Urban area. As has been described above this fact is not evident in the figures for decayed and missing, presumed carious, teeth because more of the teeth are filled. There are no statistically significant differences between any of the male or female sample groups. Many other workers have reported on the caries experience of a similar age group of children. McHugh et al (1964) (5) report a mean number of decayed teeth of 3.63, a mean of 1.71 missing teeth, and 3.77 filled teeth. The D.M.F. score in this Dundee sample was 10.02. This represents a lower number of decayed teeth than either of the samples reported here, but the Dundee figures for missing and filled teeth fall between the

9.2.1/ values quoted for the Urban and Rural areas in this survey (Tables 10 and 11). The D.M.F. value of McHugh's sample is lower than either the Urban or the Rural figure. Overall, this Dundee sample suffered less from caries than the sample groups in this study. Sheiham and Hobdell (1969) (41) report that the equivalent values in a 15-19 year age group of 275 subjects from London and Warrington were decayed teeth 1.2; missing teeth 1.5; filled teeth 8.3; D.M.F. 11.0. These figures report a similar D.M.F. but a vastly greater number of filled teeth. This study group is a different age from the present study group, and many social and cultural factors may be responsible for the higher number of filled teeth. Considerably lower D.M.F. scores are reported from other parts of the world, e.g. Iran: 5.4 (Held 1964) (71); Ethiopia: 0.2 (Littleton 1963) (72); Sudan: 1.1 (Emslie 1966) (14). An interesting study by Downer (1970) (13) on girls of different ethnic groups in a London secondary school states that the mean D.M.F. for European children was 5.90 and for Negro (including mixed Negro and European) children was 4.68. (Sample age 13-14½ years). This is a very low figure in comparison with the figures quoted in this study. Murray (1969) (73) quotes themean D.M.F. values of West Hartlepool and York 15 year old children as 4.96 and 8.95 respectively. West Hartlepool is an area with water fluoridation.

9.2.1/ In Scotland, Kilmarnock was part of the Government trial of water fluoridation. In the 9 year report on the study Mansbridge (1969) (74) reports the mean D.M.F. for Kilmarnock 14-year-old children in 1968 was 9.6 and for Ayr (which was the control town) 12.4. These figures are not fully relevant to the fluoridation issue since children of this age have not obtained the full benefit of the fluoride in the water supply. Fluoridation began in Kilmarnock in April, 1956, and was terminated in October 1962. In another study by Mansbridge (1966) (75) the mean D.M.F. score for 12-14 year old Ayrshire children was 11.57. This author quotes another of his own studies in Edinburgh where the D.M.F. for 12-14 year old children was 7.15 (Mansbridge (1959) (42). From the results quoted above, it is obvious that Scottish children have a higher caries experience than any group previously studied. These results are summarised below.

AREA		MEAN D.M.F.
Banff	(Sutherland, 1972)	11.47
Paisley		10.99
Dundee	(McHugh, 1964)	10.02
Ayr	(Mansbridge, 1966)	11.57
Edinburgh	(Mansbridge, 1959)	7.15

9.2.2 Oral Hygiene

Table 13 shows the mean values for the "Dundee" Oral Hygiene Index. These results may suffer from Examiner error. The Urban sample showed a significantly better oral hygiene ("t" test $p<0.01$) than the Rural sample. Both samples showed a highly significant difference between males and females ("t" test $p<0.001$) with females showing the better values. When male samples were compared there was also a highly significant difference ("t" test $p<0.001$) with the Urban sample showing the lower mean level of the Oral Hygiene Index. There was no statistical difference between the female populations. McHugh et al (1964) (5) showed that girls had a significantly better oral hygiene than boys. Using the same Index these workers reported a mean Oral Hygiene Index of 7.72, although they also reported problems with examiner variability. Both the areas studied here showed better levels of oral hygiene than the Dundee subjects. From the results discussed above, no consistent relationship between oral hygiene and Urban/Rural residence can be concluded, despite the statistical significance quoted. Sheiham (1969) (23) examining Surrey school children found no difference between male and female children aged 11 - 17. Sinclair and Goose (1966) (22) published results from Cheshire and the figures these workers quote show that their sample of 14-year-old females had better oral hygiene than males. James

9.2.2/ (1963) (17) agrees with these findings, but his assessment was based on the doubtful "good", "fair", "poor" system.

2.3 Calculus

Table 14 shows the findings of the examination for calculus. Consistent with the findings of the oral hygiene measurements, is the fact that the Rural total sample has a significantly higher mean calculus score than the Urban sample ("t" test $p < 0.001$). This trend is not repeated in the female samples, and is only marginally significant when the male samples are compared. ("t" test $p < 0.05$). Surprisingly, statistical analysis of the difference between males and females showed that in the Urban area there is a highly significant difference ("t" test $p < 0.001$), but in the Rural area there is no such indication of a clear relationship ("t" test $p < 0.02$). Emslie (1966) (14) in a study in Sudan reported a mean calculus index of 0.66 in 10 - 14 year olds and 1.10 in 15 - 19 year olds. The above figures are for a group using a toothbrush. The figures for those using Arak sticks to clean their teeth were 1.38 for the younger age group and 1.40 for the older age group. Sheiham (1969) (23) reported that his Surrey school children had a mean calculus index of 0.22, and that his total sample of 11 - 17 year old children had a mean calculus index of 0.24. The Scottish children reported here

9.2.3/ have a considerably higher index than these figures. McHugh et al (1964) (5) did not report a mean value for the calculus index. Suomi et al, (1971) (76) in a study of oral calculus in children, in which they unfortunately did not use the Greene and Vermillion Calculus Index, state that more older children than younger children have calculus, and slightly more males than females.

2.4 Periodontal Disease

Table 15 shows the results of the periodontal examination. These results may suffer from Examiner error. It was the exception rather than the rule to find true periodontal destruction, and the figures in the table show that gingivitis was the most common finding. The total Rural sample had a higher mean value for the Periodontal Index. This was highly significant when compared with the total Urban sample mean ("t" test $p<0.001$). The trend was reflected in a comparison between male samples ("t" test $p<0.05$). Within the Rural area there was a significant difference between males and females ("t" test $p<0.01$), but this was not so in the Urban area.

There are considerable numbers of reports of Periodontal condition in young age groups. They are summarised below (All these Surveys used Russell's Periodontal Index).

9.2.4/

Emslie (1966) (14)	Sudan. 10 - 14 yrs	1.28
Greene (1960) (19)	U.S.A. 11 - 17 yrs	0.43
Sinclair & Goose (1966) (22)	Cheshire 12 - 17 yrs	0.63
Emslie (1963) (77)	Nigeria 11 - 19 yrs	1.90
Greene (1960) (19)	India 11 - 17 yrs	0.98
Sheiham (1969) (23)	Surrey 11 - 17 yrs	0.88

The results from this study are higher than those quoted from the U.K. and U.S.A. with the exception of Sheiham's results, and less than those from Africa and India. Sheiham's results from Surrey deserve close examination. They are shown below:-

Age	Males	Females	All Children
11	0.80	0.97	0.89
12	0.73	0.99	0.85
13	0.73	1.05	0.89
14	0.77	0.88	0.82
15	0.84	1.04	0.93
16	0.87	0.98	0.93
17	0.91	1.19	1.07

Periodontal Index by Age and Sex for Surrey School children (Sheiham 1969).

Sheiham's values for 14-year-old children show a similarity with those reported from the Rural area of the present study, except that there is a reversal of values between male and female. The Rural female

9.2.4/ findings are consistent with the lower levels of oral hygiene and calculus reported for females. Other workers in the United Kingdom agree that young females have less severe periodontal disease than males (McHugh et al (1964) (5); Sinclair and Goose (1966) (22); Sutcliffe (1968) (77); James (1963) (17)).

Sheiham points out that the decrease in Periodontal Index at age 14 may be related to his findings of an improved oral hygiene at that age, or to hormonal changes occurring at puberty.

The effects of puberty were not investigated in this study. If males and females of the same age and oral hygiene are compared, then no difference in periodontal index values are found between them (Greene, 1963 (78); Löydal et al, 1958 (79)). Sheiham (1969) (23) carried out this comparison, and reported that females had more severe periodontal disease. This, the author concludes, would seem to indicate an unknown factor, other than oral debris or calculus, in the results produced from Surrey school children.

9.2.5 Oral Cleanliness and Periodontal Disease

Table 16 shows that when oral cleanliness and periodontal disease levels are compared in the Urban and Rural areas in this study, the Rural area has consistently the poorer result.

9.3 TREATMENT NEEDS

Table 17 shows the percentage of children requiring various forms of treatment. The criteria are explained in Chapter 5. The categories "no treatment", "Conservation and Oral Hygiene Instruction only", and "Oral Hygiene Instruction only" are mutually exclusive. A large percentage of Rural children were found to require no treatment, but a smaller percentage of Rural subjects required Oral Hygiene Instruction only (O.H.I. only). If these two groups are added together, approximately 5% of Rural children and 8.5% of Urban children required no treatment, or only a lesson on the home-care of the mouth. More Urban children needed Conservative Treatment and Oral Hygiene Instruction only (Cons. & O.H.I. only) to render them dentally fit than did Rural children. The total percentage of children requiring oral hygiene instruction was 38.28% (Rural) and 57.25% (Urban). This would appear to contradict the findings recorded under the Oral Hygiene Index, where Urban children were significantly better. However, reference to the periodontal treatment category shows that a much higher percentage of Rural subjects need Periodontal Treatment. Thus the figures for O.H.I. is encouraging in the Urban area since it can be interpreted to mean that more Urban children needed simple instruction, and much less needed more intense periodontal care, than was evident in the Rural area. This is consistent

9.3 with the findings in Table 16. Of the children who could not be so easily rendered dentally fit, a significantly greater number of Rural children required Conservative Treatment. This trend is still observed if this category is added to the "Cons. & O.H.I. only" category to produce the figures for Conservative Treatment; 91.25%(Rural)and 84.51%(Urban) although the percentage difference has become smaller. This is consistent with the higher value for D.M.F. teeth found in the Rural area; i.e. Rural children have a greater caries experience, and require more fillings than Urban children. However, the context of the D.M.F. teeth is not easy to explain. Rural children have more fillings, less decay, and less missing teeth than Urban children.... and yet a greater percentage of Rural children require fillings. This tends to point towards the efficiency of dental services in a Rural area, particularly the local authority service which regularly visits schools for dental inspections and treatment, in that caries is diagnosed as an early lesion, and the tooth conserved. This would account for the greater number of fillings, and the smaller number of decayed and missing teeth observed during the fieldwork. In the Urban area, a significantly greater percentage of children required extractions, i.e. more children had advanced caries in the Urban area, and this accounts for Rural children requiring more fillings than Urban children. In the

9.3/ Urban area, there is a greater availability of treatment under the general dental service, and consequently there is the likelihood that a parent will refuse on behalf of his child, to have treatment by the local authority dentist. This then places the responsibility on the parent to seek preventive dental treatment for his child. These figures show that this does not happen, and that there is a tendency for attention to be sought at the last moment, probably for the relief of pain, as shown by the figures for Conservation and Extraction Treatments. Little comment can be made about the need for dentures, due to the small numbers involved in both areas. Suffice to say that it is very sad that any 14-year-old child should be felt to need dentures.

A significantly greater percentage of Urban children needed Orthodontic treatment. This is surprising, at first, in view of the greater resources of the Urban area, in terms of dentists in general, and orthodontic practitioners in particular. However, it may be this very fact which encourages the dental manpower in the Rural area to undertake their own orthodontic treatment. It is possible that this Rural sample was less likely to require orthodontic treatment because of some genetic pre-determinant, which could be due to inbreeding within the area. Figures not published in table form show that 15.17% of Rural

9.3 children had lost teeth for orthodontic reasons; in the Urban area this figure was 9.52%. These figures tend to favour the theory that interceptive orthodontics is more readily and effectively undertaken in a Rural area.

9.4 CONCLUSIONS

4.1 General Conclusions

This chapter has shown that the Dental Habits and Dental Stuatus of the children in both Urban and Rural areas are far from ideal, and that their Treatment Requirements are great. The mean D.M.F. Teeth values of 11.47 and 10.99 are among the highest recorded in the literature, and overall, only 1.46% of the subjects required no treatment.

4.2 The Effect of the Community Factor

Area of Residence did not seem to affect the number of children who owned a toothbrush, but Urban children brushed twice per day on average compared with the once per day average of the Rural area. More Urban children ate snacks than did Rural children, and the mean number of snacks per day was higher in the Urban area. However fewer of the Urban "snack-eaters" ate carbohydrate snacks, and Urban children spent slightly less per week on confectionery. Thus, in toothbrushing and eating habits, the Urban area would appear to be the better community.

Compatible with the above information, it has

9.4.2/ been shown that children in the Urban area had better oral hygiene, calculus, and periodontal disease levels. The Urban area also had the lower caries experience, but more decayed and missing teeth were present in the children in this area. There were more filled teeth per child in the Rural area. Overall, the results from the Rural area in this survey were poorer than those from the Urban area, but, in the treatment of caries at least, the available dental services in the Rural area were being more successful in the control of dental disease. More Urban children required extractions and partial dentures, and more Rural children needed no treatment. More Urban children needed Orthodontic treatment. In view of the dental status findings, and the greater availability of treatment in an Urban area, this discrepancy in treatment requirements is surprising.

The number of children requiring the various forms of treatment in both areas was very high.

CHAPTER 10. THE EFFECT OF SOCIAL CLASS ON DENTAL HABITS, DENTAL STATUS AND TREATMENT NEEDS.

10.1 INTRODUCTION

The purpose of this chapter is to investigate the effect of broad streaming of the sample by social class, on the findings of the fieldwork. Social class was determined by the occupation of the subject's father. Since banding of a population is a relatively vague procedure, the actual results of the various findings per social class have not been presented. Instead the tables reveal the general trend, indicating whether any given finding is, or is not, significantly different from the total population findings and, where there is a significant difference, whether the result is higher (+) or lower (-) than that of the total population. The "total population" figures used in this chapter exclude those subjects of unknown social class.

10.2 DENTAL HABITS AND SOCIAL CLASS

2.1 Analysis by Five Social Classes

Tables 18A (Urban) and 18B(Rural) show the effect of social class on the social-dental habits of the subjects. Social class has no effect on toothbrushing, at any of the frequencies, three times per day, twice per day, once per day, or less than once per day, nor does social class banding reveal that any particular class is less likely to own a toothbrush. The investigation of money spent on confectionery by social class shows that, in the Urban area, classes 1

10.2.1/ & 11 tended to spend less, and class V spent more than the average. This was not quite so obvious in the Urban area, but here class 11 also spent less. In the Urban area, snack eating followed a similar trend with class 11 eating fewer and class 1V eating more snacks per day than the average. In the country district a surprising result was revealed that social class 1 children ate more snacks per day than average. This could be interpreted to mean that children of professional homes in a rural area were provided with, or given money to purchase, more snacks than other children. It is more likely that this is a false result due to the smaller number of social class 1 children in this sample. In neither Urban or Rural area did social class grouping reveal any difference in the percentage of children claiming to have a dentist, and in the Urban area there was also no effect when the percentage claiming to attend regularly was examined. In the Rural sample a lower percentage of class 1V children claimed to attend regularly. Overall, the only observation that can be made from Tables 18A and 18B is that children from upper class homes will probably spend less on confectionery, and will probably eat fewer snacks. In the Urban area children from social class V homes will spend more money on confectionery than other children. Mansbridge (1959), (1966) (42,75) has investigated the effect of social class on dental

10.2.1/ health, but his results are mainly confined to the distribution of dental caries. There is no work in the literature that can confirm or repeat these findings, since most workers have confined their investigation of social class to the dental findings.

2.2 Analysis by Two Social Classes

Table 19A(Urban) and 19B(Rural) show the same results, but with the population divided into upper and lower social strata. The upper strata is Social Class 1 and 11, and the lower strata is Social Classes 111, 1V and V. Comparing tables A and B, the first observation is that social stratification shows less effect in the Rural population (table B) i.e. 4 of the factors are not significantly different. In the Urban area, more of the lower strata brushed less than once per day; the lower strata ate a significantly higher mean number of snacks per day; of those having a dentist in the lower social group, less attended regularly. It is interesting to record that in both areas, there is a highly significant difference in the amount spent on sweets, the lower social strata spending more than the upper strata.

This subdivision of a population into two groups has been used by other workers and is probably more realistic than the 5-band stratification system of the General Register Office.

10.3 DENTAL STATUS AND SOCIAL CLASS

3.1 Analysis by Five Social Classes

Tables 20A(Urban) and 20B(Rural) show the dental findings by social class. Class V Urban children had a lower D.M.F. than the total sample ($p<0.05$). No other finding in this study provides corroborative evidence for this result, and it must therefore be assumed that this is a "false" result due to the sample size. In the Rural area, social class had no effect on D.M.F. When the recorded values for D,M, and F were examined separately by social class, the following comments could be made. In the Urban area, social class II children had fewer decayed teeth ($p<0.05$) and social class I children had fewer missing teeth ($p<0.01$) than the total sample. These results confirm expectations and are supported in general by the finding that social class II children had more fillings than the total sample ($p<0.001$). Social class V children had fewer fillings than the total sample ($p<0.001$). In the Rural area (Table 20B) there was no social class difference in the number of decayed teeth, but the Urban trend was repeated in missing and filled teeth.

Thus, when the dental findings of a group of 14-year-old children are analysed by social class, there is no difference observed in caries experience as measured by D.M.F. and little difference in the

10.3.1/ mean number of decayed teeth. There is a distinct trend for the upper two social classes to have fewer missing teeth, and more filled teeth. Children from the lower social classes tended to have fewer fillings but no evidence was found that these groups had more missing teeth than the total population.

In the Urban area, children of the upper two social classes had a better level of oral hygiene (I:$p<0.05$, II:$p<0.01$) but this was not seen in the Rural area. In both areas, social class 1 children had a lower mean calculus index (Urban:$p<0.01$, rural:$p<0.05$), and this trend was also evident in social class 11 Urban children. In both areas the mean Periodontal Index for each social class did not vary significantly from the total population.

3.2 Analysis by Two Social Classes

Tables 21A and 21B show the same results when the population is split into two class groups as before. Examination of the results presented in this form confirms that D.M.F. is not significantly different in either strata of the population. In the Urban area, the upper strata children had fewer decayed teeth, and fewer missing teeth than the lower group. In both areas, the upper social strata children had a higher mean number of fillings. Urban children in the upper social strata had a lower mean Oral hygiene index, and a lower mean calculus

10.3.2/ index and this was not repeated in the Rural area. The effects of social class on the Periodontal Index values reported above, are reproduced in these tables where neither social strata had a significantly different mean Periodontal Index value. This was the case in both areas.

It is interesting to note that in Table 21A, the findings show a definite trend; in an Urban area, upper social class children have better mouths. In Table 21B, no such trend is evident in the Rural area, where there is no significant difference between the findings except in the case of filled teeth. This difference requires some explanation. The finding that upper social class Urban children have a significantly higher mean number of fillings, is consistent with the other findings in this group, i.e. they have better mouths and/or receive better treatment. Why should Rural children in the upper social strata also show a higher mean number of fillings when the other results indicate that class division does not significantly affect the findings? Two explanations seem likely, neither of which can, unfortunately be verified. Firstly, this group of Rural children may be obtaining the advantage of both general dental practitioner treatment, and the local authority service treatment, which has already been shown to be relatively effective in a Rural area.

10.3.2/ This theory is supported by the fact that most of the parents in this group, because of the occupation categories of the classification system, are likely to live in the towns in the Rural area, and naturally this is where the few general dental practices are available. Secondly, because of the relative shortage of dentists, parents of children in this group may request that restorative measures be undertaken, rather than await the development of dental pain.

Whatever the explanation, unequivocally, filled teeth are evidence of dental attention. Thus, upper social strata Rural children are receiving a significantly higher amount of attention, although this is not borne out by the results in Table 19B, under dental attendance. In this table no significant differences were reported but there is, nevertheless, a higher percentage of Rural children claiming to see their dentist regularly.

Several workers have studied the effects of social class on dental disease. Mansbridge (1959) (42) examined 1730 Edinburgh school-children, aged between 5 and 17 years. This study split the subjects into two groups depending on whether the child attended a state or private school. The results of this study were that children who attended the private schools - the upper socio-

10.3.2/ economic group- had a higher prevalence of caries in the permanent teeth. The author also noted that these children had a lower caries prevalence in deciduous teeth and attributed this to better nutrition in the first year of life. The findings concerning permanent teeth appeared to be related to diet following the eruption of the teeth. The findings of this present study agree neither with Mansbridge's dental findings nor with his reasons. This study shows that there is no difference in D.M.F. in the various socio-economic groups. If the D, M, and F are examined separately then the upper social class children are substantially better off, especially in the Urban area. Tables 19A and 19B show that the upper social strata children also have better habits in relation to sweet consumption and snack eating.

In a later study (the same author - Mansbridge 1966) (75) examining 562 12-14 year-old Ayrshire children, a mean D.M.F. of 12.07 for Social Class 1 and 11 children was reported. The figure for Social Classes 111, 1V and V was 11.07. There was no significant difference between those figures. These results are very similar to both the Urban and Rural results reported in this study. There are no comparible figures in Mansbridge's later report on D, M, and F. The work of Koch and Martinsson (1970) (37) has already been referred to in an earlier

10.3.2/ chapter. Their general conclusion is that significantly more upper social class children have a low number of decayed and filled surfaces. In a study of students of mean age 18.8 years, Anderson, James, James and Norden (1971) (81) also showed that the lowest number of decayed and filled teeth were in the upper social classes and also showed that the dental state of their subjects deteriorated with social gradient. This study reported that the mean D.M.F. values were lower in the upper social classes. Now, bearing in mind that Koch and Martinsson's study used "surfaces" instead of "teeth" it is clear that this present study agrees with both of the above reports in that the upper social classes have fewer decayed teeth (although a significant relationship was proven only in the Urban area). This study does not agree that the upper social classes have fewer fillings. Sheiham and Hobdell (1969) (41) showed no consistent relationship between social class and D.M.F. but stated that the lower social class tend to have more missing teeth. This present study agrees with these findings (missing teeth: relationship only significant in Urban area). Tables 21A and 21B show conflicting results in the oral hygiene, calculus, and periodontal index sections. In the Urban area, the upper social strata had a significantly lower mean oral hygiene index, and calculus index, but there was no difference in the mean periodontal index. This agrees with the findings

10.3.2/ of Sheiham (1969) (23), in Surrey school children. It would appear, both in Sheiham's study and in the urban area of this study, that the better values for the oral hygiene index, in the upper social strata are not sufficiently low enough to reduce the level of periodontal disease in the same subjects.

In the Rural sample, oral hygiene, calculus and periodontal disease levels were not significantly different in either social group. This is, in part, contrary to the general trend of the results in the literature, that periodontal disease is worse in the lower social classes. However many of the studies reported in the literature are from older samples of the population, and it is possible that the effect of social class background has not made itself felt on the early levels of periodontal disease recorded in these 14-year-old children.

Why the upper social strata of Urban children should have a better level of oral hygiene is not immediately obvious. Reference to Table 19A reminds one that the upper social strata (Urban) spent less on sweets, ate fewer snacks, and went to their own dentist more regularly. There were no differences in toothbrushing frequency, except that fewer of this group brushed less than once per day. The author postulates on the basis of these observations that this group of upper social strata Urban children have

10.3.2/ a better level of oral hygiene due to their better dietary habits and to their more frequent exposure to "propaganda" during visits to the dentists. It is also possible that there is more encouragement and supervision at home.

10.4 TREATMENT NEEDS AND SOCIAL CLASS

4.1 Analysis by Five Social Classes

Tables 22A and 22B show the treatment needs of the study populations, analysed by social class. It is pertinent to remind the reader at this stage that the first three categories of treatment needs are mutually exclusive. A subject was categorised into one of these three groups, or into one or more of the other groups.

Table 22A shows that the percentages of children requiring various treatments in each social class were nowhere significantly different from the total population. In Table 22B the results are very complex, and not all the significant differences detected fit the trend discussed under Table 20A and 20B (dental findings by individual social class). Those that do fit this trend can be summarised as follows:-

1) More social class 11 children required No Treatment ($p<0.01$).
2) More social class 11 and 111 children required only Conservation and oral

10.4.1/ hygiene instruction to render them dentally fit ($p < 0.01$; $p < 0.001$ respectively).

It would be expected that social class 1 children would fit this pattern. In a Rural sample of 640 children, social class 1 subjects comprised only 1.56% of the sample (10 children). The small size of this group accounts for all the unexpected results and failures to prove relationships. The same comments apply to social class V in the Rural sample. Further results consistent with the dental findings are:-

3) More social class 111 and 1V children required Extractions ($p < 0.001$; $p < 0.05$ respectively).
4) More social class 1V children required Conservative treatment ($p < 0.02$) and Periodontal treatment. ($p < 0.01$).

There are several results in Table 22B that still require some explanation. These are:-

1) Significantly more social class 1V children require only Oral Hygiene Instruction ($p < 0.02$).

There is no explanation for this to be seen in a study of the dental habits and the dental findings

10.4.1/ of class IV children.

2) Less social class III children require Conservation and Periodontal treatment ($p<0.001$ in both cases).

None of the dental habits or the dental findings of this group (class III) were significantly different from the total population. No explanation is evident.

3) More social class II children required partial dentures ($p< 0.001$).

Examination of the other data for this social class produces no explanation of this fact. This group had in fact a significantly higher mean number of filled teeth. It is possible that this result includes partial dentures already present in the mouth, but in need of replacement. Nevertheless it is unreasonable to assume that social class II Rural children have a significantly higher number of dentures needing replaced, and as such, the basic finding has no explanation.

4) Orthodontic treatment requirements:

a) Social class III - fewer children requiring. ($p< 0.001$)

b) Social class IV - more children requiring. ($p< 0.01$)

c) Social class V - fewer children requiring. ($p< 0.05$)

10.4.1/ It would have been interesting to report in an area where less orthodontics is required than would have been expected (see Chapter 9), that children in the lower social classes required less than the total population. Unfortunately the result for social class 1V upsets this possibility. Why should social class 1V children require more orthodontic treatment than those in classes 111 and V? It has already been shown that it is possible that the rural dental services are practicing interceptive orthodontics. For this to be possible the child and the dentist have to meet regularly. It has been shown that fewer social class 1V children attend their dentist regularly, and this may be the reason why more of them require orthodontic treatment.

4.2 Analysis by Two Social Classes

Tables 23A and 23B show the same results compared in the two groups of upper and lower social strata. The Urban results show that a significantly greater number of upper social strata children needed oral hygiene instruction only ($p<0.01$), and that a significantly greater number of lower social strata children required extractions ($p<0.001$). In the Rural area a significantly higher number of children in the upper social strata required no treatment ($p<0.05$) and a higher number of children in the upper group needed partial dentures ($p<0.01$). This last finding was noted in social class 1V children in the

10.4.2/ previous tables. The explanation of this is still difficult since analysis of the dental findings by these two social strata revealed that there was no significant difference in the number of missing teeth. It must be assumed that either a) children and parents in this group are more insistent in having missing teeth replaced by dentures, and that the author and his co-worker have felt that a large number of them needed replaced, or b) the missing teeth were in such positions in enough children for the examiners to feel that dentures were required. This result is particularly surprising when it is noticed that it does not appear in the analysis of the Urban data (Table 23A) and especially when it was reported that Urban children have more missing teeth (Table 10).

Overall Tables 23A and 23B show that treatment needs are not greatly affected by socio-economic grouping of the population. If treatment needs is taken as a measure of the efficiency of the available dental services then it appears that the dental services in both Urban and Rural areas are equally available to all children and are equally effective in all social classes. The total effectiveness of the available dental services leaves much to be desired.

There is little comparative work in the literature about treatment needs of children, and none of these

10.4.2/ papers discuss the effects of social class on the reported findings.

10.5 CONCLUSIONS

In general this study shows that the effect of social class on the findings is more marked in examining dental habits and dental status, than in assessing treatment needs. It is further shown that dental habits and dental status show a more marked relationship with social class in the Urban area than in the Rural area.

Dental Habits

In the Urban area, few upper social strata children brush less than once per day. With this exception, toothbrushing frequencies appear to be unaffected by social class. Urban upper social class children have better dietary habits and more of them claim to attend their dentist regularly.

Social class has even less effect on the Rural population: upper social strata Rural children spend less on sweets.

Dental Data

There are no differences in D.M.F. or in Periodontal disease levels between upper and lower strata children in either the Rural or Urban areas. Upper social strata children in the Urban area have

10.5/ cleaner mouths, with more fillings and less decayed and missing teeth than the lower group.

In the Rural area upper social class children have more fillings.

Treatment needs

Overall it is the upper social strata that has the highest percentages of children requiring no treatment or only a lesson in oral hygiene. With two exceptions, discussed in paragraph 10.4.2, social class has little or no effect on the treatment needs of these populations.

The author feels that inconclusive results will be obtained if the results of a dental survey are analysed by social class using the five group system of the General Register Office. The classification of a population by occupation is becoming increasingly irrelevant in British society. It is specifically recommended that future studies of this nature adopt an alternative method of assessing the socio-economic status of the study population or, alternatively, using the Registrar General's system and confine the class breakdown to the two groups used in this study, i.e. an upper social strata comprising social classes 1 and 11, and a lower social strata comprising social classes 111, 1V and V.

CHAPTER 11. DENTAL HEALTH AND ATTENDANCE AT THE DENTIST.

11.1 INTRODUCTION

In this chapter an attempt will be made to find out if a child's claimed dental attendance habits affect his dental status and his treatment requirements. Do those children who claim to have a dentist and attend him regularly show evidence of a lower caries experience? Do these children have better oral hygiene, and less periodontal disease? Do they require less treatment? These are a few of the questions that this chapter will answer.

Each set of results is presented in two tables lettered "A" and "B". Table A shows the selected variable analysed by the responses to the question "Do you have a dentist?" Table B shows the variable analysed by the responses to the question "Do you attend your dentist regularly?" Obviously, only those subjects recorded as "Yes" respondents in Table A will appear in Table B.

11.2 DENTAL ATTENDANCE

Table 24A shows the percentage of children who claim to have a dentist. The figure is similar in both areas, and statistically there is no difference. The availability of dental services has been discussed in Chapter 4. When these subjects who claim to have a dentist were asked if they attended regularly, the results shown in Table 24B were obtained. Again the figures are remarkably consistent, and there is no

11.2/ significant difference. These two tables together indicate that 85-86% of 14-year-old children are likely to have a dentist (i.e. a family dentist or a dentist that the child has seen frequently enough to be considered as that child's dentist) and of this percentage, 52-56% will attend this dentist regularly. The interpretation of "regularly" is obviously wide, and no indication can be obtained whether this is for regular relief of pain, or regular visits for a "check-up". The following paragraphs correlate some of the dental status findings with the above facts.

11.3 DENTAL STATUS AND DENTAL ATTENDANCE

3.1 D.M.F. Teeth

Table 25A shows the mean value for D.M.F. Teeth for those who do, and do not have a dentist. There is a highly significant difference between the values recorded for "Yes", and for "No" in the Urban area, and a significant difference in the Rural area ("t" test: $p<0.001$ and $p<0.01$ respectively). There are no statistically significant differences in D.M.F. between the Urban and Rural subjects with a dentist, and between those without. Table 25B shows the D.M.F. values for the children who claim to have a dentist, analysed by whether they attend regularly or not. In the Rural area there is a highly significant difference between those who did, and those who did not claim to attend regularly ("t" test $p<0.001$). In the Urban area, the same

11.3.1/ comparison produced a significant difference ("t" test $p<0.02$). When the Urban and Rural values for the "Yes" responses were compared there was a significant difference ("t" test $p<0.01$), but the difference between the values for the "No" responses, was not significant.

In both the Rural and the Urban area, children who claim to have a dentist have a higher caries experience (D.M.F.) than those who do not claim to have a dentist. Furthermore, those who attend their dentist regularly have a higher caries experience (D.M.F.) than those who have a dentist but do not see him regularly. It is possible that this is because this group knows that they have a higher caries experience, and consequently have to see a dentist more regularly, but it has been shown that objective (dentist) and subjective (self) assessments of oral condition show poor correlation (Bulman et al 1968) (30). It is more likely that this is due to a retrospective judgement on the subjects' part, in that they have had a considerable amount of treatment, mostly fillings, in the recent past, whereas the group who either do not have a dentist or do not attend regularly have had only sporadic treatment over the years, probably casual attendance for extraction. No matter what explanation is attempted the fact remains that subjects who replied "Yes" to the two questions "Do you have a dentist" and "Do you attend

11.3.1/ regularly", have a higher caries experience as measured by D.M.F. It is likely that the groups that do claim to see a dentist have less decayed teeth, less missing teeth, and considerably more filled teeth than the groups who claim no attachment to a dentist. Since this distribution of caries experience was not anticipated during the processing of the data, it is unfortunate that the assumption made above can not be fully confirmed in the present study. However, analysis by hand of a random sample of 250 subjects who claim to have a dentist provides the following results.

Do you attend regularly?	Mean No. of Missing Teeth	Mean No. of Filled Teeth
Yes	1.23	6.32
No	1.62	2.88

These results are illustrated to confirm the assumption. No statistical significance should be attached to the above figures but it would seem that the mean number of fillings in those attending regularly is inordinately high, and may account for the higher D.M.F. Index. It would, thus, seem that children who attend the dentist are having prophylactic fillings placed e.g. in the fissures of

11.3.1/ molars, or that the investigations of a carious lesion on one tooth e.g. radiographs, or the preparation of a proximal surface filling is revealing caries teeth, which would not have been revealed without the use of radiographs.

3.2 Decayed Teeth

Tables 26A and 26B show the mean numbers of decayed teeth found in the various groups of dental attenders. These confirm in part the above discussion in that children, in both Urban and Rural areas, who have contact with a dentist have fewer decayed teeth. This is particularly evident in those who attend regularly where there is a highly significant difference between the results for "Yes" and "No" responses in both areas ("t" test $p<0.001$ in both cases).

3.3 Oral Hygiene and Calculus

Tables 27A and 27B show the mean "Dundee" Oral Hygiene Index values obtained from these subjects who did and did not claim to have a dentist, and for those who claimed to attend regularly, in both areas. Table 27A shows that in both areas, children who did claim to have a dentist have a better oral hygiene, but the recorded values are far from good. The difference between the values for the "Yes" and "No" respondents was highly significant in both areas ("t" test $p<0.001$). In Table 27B, the difference

11.3.3/ between the Oral Hygiene Index value for those who did and did not attend regularly was highly significant in the Urban area ("t" test $p<0.001$) and significant in the Rural area ("t" test $p<0.01$). There was a marginally significant difference between the Index for the "Yes" respondents in Banff and Paisley ("t" test $p<0.05$). Tables 28A and 28B show the mean value for the Calculus Index. These figures follow the trend reported above in that children who claim to have a dentist (Table 28A) have a lower mean value than those who do not ("t" test $p<0.001$, Urban: not significant, Rural). In Table 28B, regular attenders have a significantly lower Calculus Index than irregular attenders ("t" test $p<0.001$ in both areas).

3.4 Periodontal Disease

Tables 29A and 29B are the correlations between dental attendance and mean Periodontal Index (P.I.) values. Table 29A shows that children who claim to have a dentist have a lower mean P.I. in both areas, than those who claim not to attend a dentist. In both cases the difference between the "Yes" and "No" respondents is highly significant ("t" test $p<0.01$). Children who attend regularly (Table 29B) have a lower mean P.I. than those who do not attend regularly but only in the Urban area is the difference statistically significant ("t" test $p<0.001$).

11.4 TREATMENT NEEDS AND DENTAL ATTENDANCE

Table 30 shows the treatment needs for children who claim to attend the dentist regularly, and those who do not, in both areas. The correlation of treatment needs with whether a child has a dentist, or not, is not shown, because it is intended to analyse only treatment needs for those children who claim to have an attachment to a dentist. (The unpublished results show that children who do not claim to have a dentist are in need of more treatment than those discussed hereafter).

4.1 No Treatment

4.2 O.H.I. Only

In both Rural and Urban areas, a similar percentage of children who attend regularly, and who do not attend regularly, required no treatment. In both areas, a larger percentage of regular attenders required oral hygiene instruction only. In the Urban area, a significant relationship exists between regular attendance and the need for oral hygiene instruction only (X^2 p 0.001).

These two results can be interpreted as follows. Firstly, children who needed no treatment are probably naturally resistant to dental disease, since dental attendance does not seem to affect the percentage. How effective family background (social cl[illegible]s been in encouraging or establishing dental fitness

11.4.2/ was discussed Chapter 10. Secondly, more convincing evidence of the effectiveness of regular dental attendance is shown by the "O.H.I. only" results, although the overall picture would be improved if the dental services could reduce the number of regular attenders requiring oral hygiene instruction. If it could be assumed that dentists could successfully encourage children to brush their teeth then the first two categories of Table 30 could read as one, as follows:-

	Urban		Rural	
Regular Attenders	Yes	No	Yes	No
No Treatment %	11.44	6.20	6.25	4.15

The Urban dental services in particular, would not seem to be providing enough oral hygiene instruction, according to the figures in Table 30, where 10.77% is the percentage of children shown to need oral hygiene instruction only to complete their dental health.

(All statistical testing in this section was by X^2 2 x 2 contingency tests.)

4.3 Conservation and O.H.I. only

To complete the exclusive classifications of treatment needs, a higher percentage of regular attenders require conservative treatment and oral

11.4.3/ hygiene instruction only, in both areas. It would seem surprising, that more children who attend the dentist need more fillings, but this is not the case. The percentage in this category are increased because of the oral hygiene instruction needs, since, if a child needed fillings and another treatment e.g. periodontal, he would not be in this exclusive category. This confirms the trend reported above, that more regular attenders need only a lesson in toothbrushing to complete their dental fitness.

4.4 Conservation

The results for those requiring Conservative treatment indicate that, in both Rural and Urban areas, a lower percentage of regular attenders require fillings, than do irregular attenders. However, to determine the true situation the Categories "Conservative" and "Cons. & O.H.I. only" must be added together to examine the total number of children requiring fillings, viz:-

	Urban		Rural	
Regular Attenders	Yes	No	Yes	No
% Needing Fillings	87.85	81.37	87.35	93.58

These figures now show that, in the Rural area, fewer children who attend regularly need fillings, but in the Urban area, more of the regular attenders

11.4.4/ need fillings. Statistical testing establishes a relationship in the figures for the Rural area (X^2 $p<0.02$). This confirms the impression that, in this area, attending the dentist regularly, has reduced the number of children requiring fillings. In the Urban area no relationship could be established to lend weight to the fact that more regular attenders needed fillings. It is interesting to note that, in both areas, 87% of children who do attend regularly were found to need fillings. If then the need for fillings is compared with the mean no. of decayed teeth (Table 26B) as follows:-

	Urban		Rural	
Regular Attenders	Yes	No	Yes	No
Mean No. Decayed	4.48	6.03	4.10	5.46
% Requiring Fillings	87.35	81.37	87.85	93.58

.....it will be seen that the inconsistent figure that requires explanation is the lower percentage of Urban irregular attenders that require fillings (81.37%). The most likely explanation is that, since these children all claim to have a dentist, the "No" respondents in the Urban area had had a course of treatment sometime previously, and did not consider

11.4.4/ themselves now to be regular attenders. This trend is not repeated in the Rural results shown above, and this may be due to the different interpretation of "regular" attender in an area where the local authority dental service is relatively more important.

4.5 Periodontal treatment

In both Rural and Urban areas less of the regular attenders needed periodontal treatment ($p<0.02$; $p<0.01$, respectively). This is consistent with expectations, since children who do attend the dentist will have regular scaling and polishing performed, and this is verified by the results shown in Tables 28B and 29B where regular attenders have been shown to have less calculus and less periodontal disease. Regular removal of calculus prevents periodontal deterioration, but, other than that procedure it is unlikely that active periodontal therapy such as curettage, or gingevectomy is being carried out in children of this age. Therefore, the reduction of periodontal requirements in regular attenders must be due to the scaling and polishing procedures, and not to oral hygiene instruction, since it has been shown that more regular attenders need oral hygiene instruction. As discussed above, greater effort on home care instruction from all branches of the dental services would increase the numbers needing no treatment and would also decrease the number of regular attenders who needed periodontal treatment.

11.4.6 Extractions

In both the Rural and Urban areas, a significantly lower percentage of regular attenders required extractions ($p<0.001$ in both cases). Despite the difference, in the need for Extractions, between the two total samples the percentage of children who attend regularly, yet still require Extractions, is remarkably similar (14.9 and 16.6). This is the second instance of similar percentages in both areas. It has already been shown that the total percentage of regular attenders requiring fillings is 87. From these two findings it would seem that dentists have a consistent "success" rate in both Urban and Rural areas i.e. of the children who claim to attend regularly, 87% need fillings, and approximately 15% need extractions. The only other alternative explanation is that the children in both areas are consistently misinterpreting their dental attendance habits during the survey interview. Some misinterpretation is expected, but not to this level of consistency.

4.7 Dentures

Fewer regular attenders needed partial dentures, which is consistent with the expected trend and with the findings under Extractions. Again the percentages are remarkably similar in both areas.

The three Urban and two Rural children who required Full Dentures had such bad mouths that they

11.4.7/ had obviously seldom been near a dentist, and must be false responses to the original question "Do you have a dentist".

4.8 Orthodontics

In the Rural area, the percentage of regular attenders who required orthodontics was not significantly different from the percentage of non-regulars requiring orthodontics. This tends to encourage the view, already expressed, that fewer Rural children need orthodontics because of a genetic pre-determinant. In the Urban area, significantly fewer regular attenders needed orthodontic treatment ($p<0.001$).

11.5 CONCLUSIONS

Over 50% of children claimed to have a dentist and attend regularly. These children have been shown, in both Urban and Rural areas, to have a higher caries experience than irregular attenders or those who do not have a dentist. There are several reasons for this, and these were discussed in paragraph 11.3.1.

Children who did claim to see a dentist regularly had less plaque and calculus than those who did not, in both areas. These children also have a lower mean Periodontal Index value, in both areas.

Although there were variations in the levels of statistical significance, the effect of claimed dental

11.5/ attendance on dental status was the same in both areas. However, the results reflected the differences found in the levels of dental disease in each area (Chapter 9).

Dental attendance did not affect the percentage of children who required no treatment, but a larger percentage of regular attenders required only a lesson on home-care of the mouth. It is not unrealistic to expect that regular attenders at the dentist who require no operative treatment could have been given oral hygiene instruction by their dentist to ensure that they continue to need no treatment.

Fewer children who attended their dentist regularly required fillings or extractions. However, it has been shown that a total of 87% of regular attenders need fillings, and a total of approximately 15% require extractions. This is not good evidence for the efficiency of the dental services, especially since this was found in both areas, and, thus reduces the possibility of these results being due to false answers from the children.

Fewer children who attend regularly need periodontal treatment, and fewer require partial dentures. The effect of regular attendance on the need for orthodontic treatment was not marked in the Rural area, but was significant in the Urban area,

11.5/ where fewer regular attenders required this treatment.

In general, those children who claim to have a dentist and attend him regularly had better dental health, and required less treatment, but these findings are only relative since even this group of children had substantial dental disease and required considerable treatment. This would indicate that the dental services available are unable to cope with the situation probably due to a combination of insufficient manpower, and an approach which tends to perpetuate the problem rather than prevent it, i.e. a restorative orientation, rather than a preventive orientation, of the dentists.

CHAPTER 12. THE RELATIONSHIP BETWEEN TREATMENT NEEDS AND CERTAIN SOCIAL FACTORS, AND DENTAL STATUS FINDINGS.

12.0 INTRODUCTION

This chapter examines in depth the treatment needs of the two samples of children examined in this study. The reader is reminded that a child was placed in one of the categories "No Treatment", "Oral Hygiene Instruction Only" (O.H.I. only) or "Conservation and Oral Hygiene Instruction Only" (Cons. and O.H.I. only) OR in one or several of the others. In this chapter the remaining categories will be abbreviated as follows:

Periodontal..... Perio.
Conservation..... Cons.
Extractions..... Extns.
Part Dentures..... Part Dents.
Full Dentures..... Full Dents.
Orthodontics..... Ortho.

12.1 TREATMENT NEEDS (TABLE 17)

This was discussed in Chapter 9. The main results found were as follows:-

8.5% of the Urban subjects and 5% of the Rural subjects required no treatment or only a lesson on toothbrushing.
A significantly greater number of Rural children required Cons. (55.78%)
A significantly greater number of Urban children required Extns. (31.09%)

12.1/ A significantly greater number of Rural children required Perio. (47.34%)
A significantly greater number of Urban children required Ortho. (53.37%)

In Chapter 9 these results were fully discussed and compared with some of the basic dental findings; observations were made about the effectiveness of the dental services available in the sample areas.

12.2 TREATMENT NEEDS AND SOCIAL CLASS
TABLES 22A, 22B, 23A, 23B.

These results were discussed in Chapter 10. When the results were analysed in 5 socio-economic bands (Table 22) there were no significant differences between the numbers of children requiring a treatment in any social class, and the total sample in the Urban area.

In the Rural area, there were several significant differences, some of which were consistent with other findings in the Social Class analysis, and some of which fitted the expected trend of increasing dental interest and awareness with increasing social class. Other results were inconsistent with the dental findings or with the expected trend, and these were fully discussed in Chapter 10.

Table 23 examined the need for treatment in two socio-economic groups, and the overall impression was that treatment needs were not greatly affected

12.2/ by social class, or conversely, the treatment services available in each area were equally obtainable by children of all socio-economic groups.

12.3 TREATMENT NEEDS AND TOOTHBRUSHING FREQUENCIES FIGS. 31A & B; 32A & B.

The results of this complex analysis have been presented as histograms instead of tables in an attempt to determine the following facts:-

1. Does the pattern of toothbrushing frequency vary in a group of children depending on the predominant treatment they require?
2. Do the treatment requirements vary with the pattern of toothbrushing frequencies? i.e. does any one frequency of toothbrushing reduce the amount of treatment required?

3.1.0 The Variation in Toothbrushing Patterns in Relation to Treatment Needs. (Figs. 31A; 31B)

The percentage of children brushing at each frequency in the total samples was shown in Table 4. These results are repeated in histogram form in these figures for comparison with the populations needing the various forms of treatment. In the following analysis for different patterns ± 3% is taken as critical.

12.3.1.1 Urban Area (Fig. 31A)
No Treatment

Surprisingly, no children in this section brushed three times per day, but a slightly greater percentage brushed twice per day. Overall, the pattern is similar to the total sample.

O.H.I. Only

More children in this category brushed twice per day, and fewer only once per day. Overall, the pattern is similar to the total sample.

Cons. and O.H.I. Only

The pattern of toothbrushing frequencies in this group is very similar to the total sample.

Cons.

The pattern of toothbrushing frequencies in this group is very similar to the total sample.

Perio.

Here, the pattern is different from the total sample. Fewer children brushed twice per day, and more brushed less than once per day, or had no brush.

Extns.

Again the pattern is different, with fewer children brushing twice per day and more brushing less than once per day than in the total sample.

12.3.1.1/ Part Dents.

The pattern is different from the total sample, with fewer brushing twice per day, and a much greater number brushing less than once per day.

Full Dents.

Obviously a different pattern in this case, but the number of subjects in this group was only 3, so little comment can be made on this result.

Ortho.

Not included in this analysis since tooth-brushing cannot have any effect on the need for this treatment.

It would seem that the brushing habits are better in those needing the least amount of treatment when the patterns are compared with that of the total sample. However, the brushing habits of the total sample are not to be considered good, by any standard.

3.1.2 Rural area (Fig. 31B)

It should be noticed that the pattern for the total Rural sample is different from that for the total Urban sample.

No Treatment

There is a marked difference in the tooth-brushing pattern here. A much higher number of

12.3.1.2/ children brushed once per day, and a higher number brushed three times per day. Considerably fewer brushed less than once per day.

In the Urban area, the "No Treatment" brushing pattern was not noticeably different from the total sample. In the Rural area it is better. Table 17 reported that a higher percentage of Rural children needed no treatment. It is not intended to relate these improved brushing habits to the fact that more rural children needed no treatment. The only conclusion that can be made is that, in an area where once per day was the most common frequency of toothbrushing, 46.5% of those requiring no treatment brushed once per day and may be one of many factors accounting for their dental health.

O.H.I. Only

Greater numbers of subjects brushed once or twice per day than in the total sample. None brushed three times per day, and fewer brushed less than once per day. Again the pattern is different from that of the total sample.

Cons. and O.H.I. Only

More children brushed once per day, and fewer brushed less than once per day. A slightly different pattern from that of the total sample is evident here.

12.3.1.2/ Cons.

Slightly more children brushed less than once per day, but this is a similar pattern to that of the total sample.

Perio.

A different pattern is evident here. Fewer children brushed once or twice per day, and a greater number brushed less than once per day, or had no toothbrush.

Extns.

Fewer brushed twice per day, and a greater number brushed less than once per day or had no toothbrush. This is also a different pattern to that of the total sample.

Part Dents.

In view of the treatment required in this section, the pattern is hard to interpret. More brushed once per day, fewer brushed twice per day, and more brushed three times per day. The only explanation that can be offered to account for this different and unexpected pattern is that more of this group needed replacement partial dentures, by the examiners' criteria, and that a child with a part denture present could well adopt similar or better toothbrushing habits than the average child.

12.3.1.2/ Full Dents.

No comments justified, since there were only two subjects.

Ortho.

Not analysed.

3.1.3 Conclusions

Despite the different pattern of toothbrushing frequencies in the two samples, the following trends are evident in both areas.

1. Children requiring "No Treatment" and "O.H.I. only" have better than average patterns of toothbrushing frequencies.

2. Children requiring Perio. and Extns, have worse than average patterns of toothbrushing frequencies.

3. Children requiring Cons. and O.H.I. only, or Cons. showed no difference in their toothbrushing habits when compared with the total sample.

4. There was a difference in the patterns of toothbrushing frequencies between the group needing Part Dent. in both areas. The Urban sample showed a poorer pattern of toothbrushing, and the Rural sample showed a better pattern. This is probably due to the varying content of replacement

12.3.1.3/ dentures in these groups, on the assumption that a partial denture may cause a child to use his brush more often.

3.2.0 The Variation in Treatment Needs with Toothbrushing Frequency. (Figs. 32A; 32B)

The percentage of subjects in the total samples that needed various forms of treatment was shown in Table 17. These results are reproduced here in histogram form, for comparison with the treatment needs of those brushing at each frequency. A difference of ± 3% is taken as critical.

3.2.1 Urban Area (Fig. 32A)

Once per day

A very similar pattern of treatment needs is evident here. More children brushing at this frequency needed Extns. than in the total sample.

Twice per day

Again the pattern is similar to that of the total sample. However, fewer subjects needed Perio. or Extns.

Three times per day

A pattern that is noticeably different from that of the total sample, is evident. More subjects needed O.H.I. only to render them dentally fit, and more needed Cons. Fewer subjects needed Cons. and O.H.I. only, and fewer needed Perio., Extns., and

12.3.2.1/ Part Dents. Overall, this is a much better pattern of treatment needs than in the total sample.

Less than once per day

Fewer children required Cons. and O.H.I. only for dental fitness, and more needed Perio., Extns., and Part Dents. A different and poorer pattern of treatment needs is shown here.

No toothbrush

There is a completely different pattern evident here. Fewer children could easily be rendered dentally fit by O.H.I. only or by Cons. and O.H.I. only, and much larger numbers of subjects needed Cons., Perio., and Extns.

3.2.2 Rural area (Fig. 32B)
Once per day

More children needed Cons. and O.H.I. only to achieve dental fitness, and fewer needed Cons., and Perio. This brushing frequency produces a different pattern from that of the total sample.

Twice per day

A similar pattern is produced here to that of the total sample, but fewer children needed Perio. and Extns.

Three times per day

The results here form a pattern which is markedly different from that of the total sample.

12.3.2.2/ More children required no treatment, and no children required O.H.I. only. Fewer required Cons., and Extns. An unusual feature of this pattern, when compared with that of the total sample is that the same percentage of subjects require Perio. and more require Part. Dents. Overall, this pattern of treatment needs is an improvement on that of the total sample.

Less than once per day

Again, the pattern is different. Fewer children can be rendered dentally fit by Cons. and O.H.I. only, and more need Cons., Perio., and Extns. This is a worse pattern of treatment needs than that of the total sample.

No toothbrush

Here, the pattern is very different from that of the total sample. No children needed O.H.I. only and fewer needed Cons. and O.H.I. only. Considerably greater numbers needed Cons., Perio., and Extns.

3.2.3 Conclusions

When compared with the total samples' patterns of treatment needs, it appears that not having a toothbrush, or using a brush less than once per day increases the need for treatment. Brushing three times per day seems to improve the situation,

12.3.2.3/ although, in the Rural area, there is also an improvement with the once per day frequency.

3.3 Variations within the brushing frequencies, of the pattern of treatment needs

This section makes observation, based on the findings for both areas (Figs. 32A; 32B) about the variation in treatment needs between the various frequencies of toothbrushing, rather than making comparisons with the total sample.

The following are the observations:

1. Brushing every day reduces the general need for treatment, when compared with brushing less than once per day. The only exception to this is the need for Part Dents. in the Rural area, which would seem to be totally unrelated to any toothbrushing frequency.

2. In the Urban area, the twice per day group has the highest percentage of subjects who were, or could more easily be rendered, dentally fit (No treatment, O.H.I. only, Cons. and O.H.I. only: total 61.5%).

3. In the Rural area, the once per day group had the highest percentage of these subjects (58.5%). These percentage figures are remarkably similar, despite different tooth-brushing frequencies. This suggests that toothbrushing at any daily frequency will

12.3.3/ not increase dental health, but may prevent a more serious situation from developing.

4. In the Urban area, toothbrushing at any frequency appears to have little effect on the need for Cons., although there would seem to be a slight increase in the number requiring this treatment in the three times per day group. Contrary to this, in the Rural area children brushing three times per day need considerably less Cons. than the once and twice per day groups.

5. In the Urban area, brushing three times per day reduces the need for Perio. and Extns. In the Rural area, Extns. fits this pattern, but Perio. does not.

6. Overall, no daily frequency can be singled out as having the best effect on treatment needs.

3.4 General conclusions about toothbrushing

The following conclusions can be made from the foregoing analysis.

1. Having a toothbrush, and using it at least once per day reduces the need for treatment.

2. Children who need no treatment, O.H.I. only or Cons. and O.H.I. only had better brushing patterns.

12.3.4/ 3. Children who needed Perio. or Extns. were much more likely to have no toothbrush or to brush sporadically.

4. Despite a clear link between toothbrushing and extractions required due to caries, no clear relationship exists between toothbrushing frequencies and the need for Cons., although there was a greater number of subjects requiring this treatment in the less than once per day group, and in the no brush group.

5. No clear indication of the best number of times to brush per day is given by an analysis of these results, although brushing every day, at least, may reduce the tremendous need for fillings. There is little doubt that children should be taught how to use a toothbrush. This analysis has looked at the effect of stated toothbrushing frequencies. Frequency of brushing would be almost irrelevant if each child's method was effective in removing bacterial plaque.

3.5 Findings of Similar Studies

No directly comparable study has been carried out, relating toothbrushing frequencies to treatment needs. Mansbridge (1966) (75) has studied the relationship of toothbrushing and D.M.F.

12.3.5/ values, in 12-14 year-old Edinburgh children. He reports no significant difference in the mean D.M.F. values of those subjects brushing more than, or less than once per day. MacKendrick (1972: personal communication) (82) reported that in Skye children there was a higher incidence of caries in those children who claimed to brush their teeth most frequently. He hypothesises that a child with a high caries experience attends the dentist regularly, and is exposed to more "propaganda", and thus comes to believe that toothbrushing will reduce dental decay, and will therefore brush more often. (MacKendrick also showed a strong correlation between toothbrushing frequency and Plaque Index and Gingival Index. The same correlation can be shown in unpublished data from this study. Thus, there is a substantial element of truth in a child's stated brushing frequency).

The dental profession's evidence on the relationship between toothbrushing and the onset of dental caries is still confusing. Fosdick (1950) (83), and Weisenstein et al (1954) (84) have shown that brushing after every meal will reduce caries and Mansbridge (1959) (42) showed that 12-year-old Scottish children with "good" oral hygiene had fewer D.M.F. teeth. McHugh et al (1964) (5) showed no tendency for the children in their Dundee

12.3.5/ study to have more D.M.F. teeth with poorer oral hygiene. Much of this evidence must be regarded with little consequence in view of the outstanding evidence of Gustafsson's famous Vipeholm study (1954) (6) which showed the effect of sticky carbohydrates between meals on caries incidence.

The evidence that poor oral hygiene is directly related to the incidence of periodontal disease, and that toothbrushing will help prevent this disease is now a well established fact, and requires no further discussion in view of the confirmatory nature of the results of this study.

12.4 TREATMENT NEEDS AND THE MEAN NUMBER OF SNACKS PER DAY. TABLE 33A(URBAN) AND 33B (RURAL)

These tables show the mean number of snacks per day for the subjects who did, and who did not require each form of treatment including "No Treatment".

4.1 Urban Area

Children needing no treatment ate significantly fewer snacks ($p<0.05$), as did children who required O.H.I. only ($p<0.01$). Children who required Extns., Part Dents., and Full Dents. ate more snacks than those who did not need such treatment ($p<0.05$: $p<0.01$: $p<0.001$ respectively). This is consistent with the expected trend that eating between meals will cause an increase in the need for treatment.

12.4.2 Rural Area

There were no significant differences in these results.

4.3 Conclusions

The difference between the Urban and the Rural results would seem to indicate that snack eating does not play a consistent part in the development of dental disease. Table 6 showed that a significantly lower percentage of Rural children ate snacks, than did Urban children, although the Rural percentage was as great as 73.59. Table 8 showed that Rural children ate significantly fewer snacks per day than Urban children. However, despite the fact that fewer Rural children ate a lower mean number of snacks, significantly more of these snacks were carbohydrate snacks (Table 7). Thus, the snack-eating habits of Rural children is probably not as good as the lower means in Table 33B would indicate. The evidence of Gustafsson's Vipeholm study on the effect of between-meal eating habits on caries incidence was conclusive. However, this study demonstrates no significant difference in the mean number of snacks per day between those requiring and those not requiring Cons., in both areas.

All that can be stated from the results in Table 33A and Table 33B is that, in the Urban area

12.4.3/ certain treatment needs showed a relationship with snack eating whereas no such relationship existed in the Rural area.

12.5 TREATMENT NEEDS AND THE MEAN AMOUNT SPENT ON SWEETS PER WEEK. TABLE 34A (URBAN) AND 34B(RURAL)

These tables show the mean amounts spent on sweets per week by the subjects who did, and who did not require each form of treatment including "No Treatment".

5.1 Urban Area

Children who required O.H.I. only spent significantly less on sweets per week, than those who needed other treatment ($p<0.01$). Children who required Extns. and Part Dents. spent more per week than those who did not ($p<0.05$: $p<0.001$ respectively). Other than these, no significant differences were found.

5.2 Rural Area

Children who needed Cons., Extns., and Full Dents. spent significantly more on sweets than those who did not need this treatment ($p<0.05$: $p<0.05$: $p<0.001$ respectively). Other than these, no significant differences were found.

5.3 Conclusions

The consistent result from these tables is that children who require Extns. spend more per week on

12.5.3/ sweets than those who do not require Extns. (It is presumed that a child who spends money on sweets will, in fact, eat the confectionery that he has bought). This is consistent with the result in Table 33A where it was shown that children requiring Extns. ate more snacks per day than those who did not need Extns. Thus, eating sweets and snacks certainly results in an increased number of children with carious cavities beyond restoration.

Overall, Table 34 shows that children spending larger amounts of money on sweets are more likely to need treatment for the removal and replacement of teeth.

12.6. TREATMENT NEEDS AND SELECTED DENTAL FINDINGS

The final four tables in this study examine the variation in the mean values of certain dental indices between those who did, and those who did not need a form of treatment. Because each subject was allocated to a treatment category on the basis of the overall dental findings in that subject, the following analysis will reveal some very strong correlations which should, therefore, not be interpreted as results. Examples of these "built-in" correlations would be:-

1. Subjects with calculus present were automatically allocated to the Perio. category, and others as necessary.

12.6/ 2. Subjects with gingivitis were also allocated to the Perio. category, among others as necessary. (See Chapter 6 for definition of "gingivitis" in relation to treatment needs).

3. Subjects requiring no treatment, or O.H.I. only or Cons. and O.H.I. only will have no calculus, and their level of plaque will be low. In the case of those requiring no treatment, plaque present will be attributable to the daily build-up only. In the other two categories, plaque present can be removed by conscientious tooth-brushing, after instruction. There is not enough plaque to warrant a scaling.

4. With the D.M.F. Index, it is more difficult to anticipate "built-in" correlations with those subjects needing Cons. and O.H.I. only, Cons. or Extns., since this index is one of total caries experience and not simply one of decayed teeth. A subject was allocated to one of the two categories for fillings if he had decayed teeth present and the Penetration Score for any tooth was 2 or 3 (see Chapter 6). If the Penetration Score for any tooth was 4, then the subject was allocated to the Extns. category, and others as necessary. There would, there-

12.6/ fore, be a strong "built-in" correlation if the D.M.F. was composed entirely of "D's". However, most subjects had a D.M.F. composed of all three elements, but Missing teeth may have allowed interproximal cavities to be diagnosed by the examiners in this study, and certain Filled teeth may have decayed due to recurrent caries. Thus, in the results that follow, "built-in" correlation should exist between D.M.F. and Cons. and O.H.I. only, Cons., and Extns.

6.1.0 Treatment Needs and Mean D.M.F. Values Table 35A(Urban) and 35B(Rural)

These tables show the mean D.M.F. values for those subjects who did require, and who did not require each form of treatment including "No Treatment".

6.1.1 Urban Area

Children who required O.H.I. only had a significantly lower caries experience as measured by D.M.F. ($p<0.001$). The mean value of this group was 6.96. There are several interpretations of this finding.

1. This is a group of children more resistant to caries.
2. These children went more regularly to the dentist and caries was treated almost as soon as it developed, consequently the mean D.M.F. as recorded consists entirely of

12.6.1.1/ filled teeth (N.B. "sticky fissures" were ignored when assessing the need for treatment).

In Chapter 11, (Table 30) it was shown that a significantly greater number of children who required O.H.I. only attended the dentist regularly.

3. These children had several missing teeth as a result of previous caries, and the better spacing and desire to avoid further episodes of toothache reduces the onset of caries. The D.M.F. is mostly missing teeth, with a small fillings element.

4. As a group these children had all completed a course of treatment just before the study period. This explanation does not account for the lack of need for other treatment implicit in the definition of this category.

5. Better plaque levels in this group made them more resistant to caries. Table 36 will show that this group does not necessarily have better oral hygiene.

Overall, it is felt that explanations 1. and 2. are the most likely, especially if combined. The group of Urban children requiring no treatment also had a lower mean D.M.F. and, although it was not a significant difference, follows the same

12.6.1.1/ pattern as discussed above.

Table 35A also shows that children requiring Extns. and Part Dents. had a significantly higher D.M.F. ($p<0.001$ in both cases). The Extns. result is partly due to the design of the criteria.

There was no significant difference in the mean D.M.F. of those requiring and those not requiring Cons. This could be taken to mean that caries is being treated by the dentist. The explanation is as follows: The average D.M.F. in this group is 10. In those who require Cons. this figure could be made up as follows:-

4 Decayed: 2 Missing: 4 Filled.

In the group who do not require Cons. the D.M.F. could be as follows:-

1. 0 Decayed: 2 Missing: 8 Filled

or

2. 0 Decayed: 4 Missing: 6 Filled.

Children satisfying the second possibility would also be allocated to the Extns. group if the need for extraction was obvious to the examiners in this study. Other than this the only conclusion that can be made from this Urban area's results is that children who need fillings do not have a higher caries experience than those who do not.

12.6.1.2 Rural Area

The findings, in the Urban area, that children requiring O.H.I. only have a lower mean D.M.F., and that children requiring Extns., and Part Dents. have a higher mean D.M.F. is repeated in the Rural sample ($p<0.01$: $p<0.001$: $p<0.001$ respectively). The explanation is identical. Children requiring no treatment also had a significantly lower mean D.M.F. ($p<0.001$), and this can be explained in a similar manner to that given for O.H.I. only, in the Urban area.

Table 35B also shows that children requiring Cons. and O.H.I. only had a significantly higher mean D.M.F. ($p<0.001$). This must be due to the fillings element, since it has been clearly established that children requiring O.H.I. only have a lower caries experience. This result is difficult to interpret since the result of those requiring Cons. does not reproduce this higher mean D.M.F. However, the children in the Cons. and O.H.I. only group require no other treatment, and it would be assumed that the mean D.M.F. of this group would follow the trend of the other two groups "No Treatment" and O.H.I. only, and be a lower figure. This is not the case, and the only possible explanation is that these subjects know that they are susceptible to caries, or that their parents

12.6.1.2/ are more interested, and consequently, they visit their dentist more regularly. Table 30 did, in fact, show that more children who required Cons. and O.H.I. only visited their dentist regularly. Table 22B showed that a significantly greater number of Social Class 11 children needed Cons. and O.H.I. only, in the Rural area.

It is also difficult to explain why those who required Ortho., in the Rural area, had a lower caries experience. It will be shown in Table 36 that there is at least a trend for those needing Ortho. to have a lower plaque level, but since the relationship between oral hygiene and caries is, at least, tenuous it would be unwise to suggest that children kept crowded mouths cleaner, and hence reduced the caries incidence. A full explanation is not obvious from these figures.

6.1.3 Conclusions

It is only possible to conclude that an awareness of caries experience, or susceptibility, may alter a child's attendance pattern. Table 25 confirms that regular attenders have a higher D.M.F. Consequently treatment needs may be altered by caries experience.

The complexities discovered in an analysis of treatment needs and mean D.M.F. values indicate that a more exhaustive study is required into the

12.6.1.3/ relationship between mean numbers of Decayed, Missing and Filled teeth and treatment needs.

6.2.0 Treatment Needs and Mean "Dundee" Oral Hygiene Index Values
Table 36A(Urban) and 36B(Rural)

These tables show the mean values of the "Dundee" Oral Hygiene Index for those subjects who did, and who did not, require each form of treatment, including "No Treatment".

6.2.1 Urban area

In those groups of children who were, or could most easily be rendered, dentally fit (No Treatment, O.H.I. only, and Cons. and O.H.I. only) the mean plaque scores were lower than those not in each group. In two cases there was a statistically significant difference. (No Treatment $p<0.001$: O.H.I. only $p<0.01$). In those children who required more treatment, those who required Cons., Perio., Extns., and Part Dents. had significantly poorer mean plaque scores. ($p<0.05$: $p<0.001$: $p<0.001$: $p<0.001$ respectively). Those requiring Full Dents. also had high plaque levels, but the low numbers in this group rendered the results statistically inaccurate.

It should be remembered that the level of plaque found in each subject affected the allocation to a treatment category. Children had to have little or no plaque, among other criteria, to be

12.6.2.1/ allocated to the "No Treatment" group. (This group records the lowest value for mean "Dundee" Oral Hygiene Index). Plaque level was not a decisive factor in allocating a child to the Perio treatment group.

Thus, despite the above reservations due to the criteria, it is quite clear that, in this Urban area, a child with poor oral hygiene will require more than one type of treatment. The group with the highest plaque level were those requiring Extns.

Children in this area who required Ortho. had a significantly better plaque level than those who did not ($p < 0.001$). This seems strange, since the main criteria for the Ortho. category was crowding of the arches. Table 35A reported a trend for those requiring Ortho to have a higher caries experience (not significant). Thus, here is a group of children who are thought to need treatment to relieve crowding, and who have a slightly higher caries experience and significantly cleaner mouths. It may be that a crowded mouth induces a child to brush more efficiently. This requires further investigation, but there are two facts which may immediately disprove the above relationship. Firstly, this group of children requiring Ortho. certainly includes some subjects who require

12.6.2.1/ treatment for spacing, and secondly, those children who require Ortho. do not have clean mouths; their mouths are cleaner than those who do not require this treatment.

6.2.2 Rural Area

With small differences in the value of "p" in the statistical testing, the results from this area are almost identical to the Urban results. There are two exceptions:-

1. There was no significant difference between the recorded plaque levels for those who required O.H.I. only, and those who required other forms of treatment. The results do show a slight trend in the same direction as those from the Urban area.

2. There was no significant difference between the recorded plaque levels for those who did need Ortho. and those who did not, although the trend was in the same unexpected direction as in the Urban area. The results for those requiring Full Dents. are bizarre and should be ignored since the sample size is very small.

12.6.2.3 Conclusions

Only one general conclusion can be made; improvement in oral hygiene would reduce the numbers of children requiring the more serious forms of treatment.

6.3.0 Treatment Needs and Mean Calculus Index Values Tables 37A (Urban) and 37B (Rural)

These tables show the mean calculus index values for those subjects who did, and who did not require each form of treatment, including "No Treatment".

6.3.1 Urban Area

Table 37A shows a highly significant difference ($p<0.001$) in the mean calculus index in all categories except Part Dents., Full Dents. and Ortho. which show no significant difference.

The following groups have no calculus by design of the criteria for assessing treatment needs. Those who need No Treatment, O.H.I. only and Cons. and O.H.I. only; those who do not need Perio. The highest value of all is, not surprisingly, the mean of those who require Perio. and this figure can be taken as the mean value of those with calculus, since every child who had calculus would be in this group.

The only two categories in which the significant

12.6.3.1/ difference cannot be accounted for by criteria design are Cons. and Extns. Thus, children who needed these treatments would appear to have a greater amount of calculus. The fact that a child needed Ortho. seemed to make no difference to the level of calculus.

6.2.3 Rural Area

The results here are identical, including the value of "p" obtained in the statistical testing. (The Full Dents. result should be ignored due to the small sample size). In this Rural area, a slight trend towards an increased mean calculus index is recorded by those requiring Ortho.

6.3.3 Conclusions

It would seem that children who require Cons., and Extns. have a higher mean calculus index. In the Urban area, there is a trend for those requiring Part Dents. to have an increased mean calculus index, and in the Rural area there was a slight increase in the mean calculus index in those requiring Ortho.

6.4.0 Treatment Needs and Mean Periodontal Index Values Tables 38A(Urban) and 38B(Rural)

This table shows the mean periodontal index values for those subjects who did, and who did not, require each form of treatment including "No Treatment".

12.6.4.1 Urban Area

Those children who were, or could most easily be rendered, dentally fit (No treatment, O.H.I. only, Cons. and O.H.I. only) had a significantly lower mean periodontal index value, but children were allocated to these groups because of a low level of gingivitis among other findings.

Children who required Perio. had a significantly higher level of gingivitis as measured by the mean periodontal index, but the presence of gingivitis was a main factor in allocating a subject to this group.

Children who required Extns., and Part. Dents. had a significantly higher mean periodontal index value than those who did not ($p<0.001$).

Children who required Ortho. had a significantly higher mean level of gingivitis than those who did not need this treatment. This is an interesting result, since no relationship could be shown between caries experience and the need for Ortho. in the Urban area. Thus, it cannot be stated that children with a need for Ortho. have a higher level of dental disease. Table 36A did show that, in the Urban area, children requiring Ortho. had a higher mean plaque level, and the relationship between plaque and gingivitis is well

12.6.4.1/ established. Thus, children who require Ortho., which was mainly assessed by crowding, have more plaque, and hence develop more gingivitis. The imperfection of tooth relationships within each arch implicit in those needing Ortho, would seem to have no effect in causing gingivitis, since the mean recorded periodontal index value is the same as that of those needing Perio.

There was no relationship between the level of gingivitis and the need for Cons.

The highest value of the periodontal index was recorded for those who needed Full Dents.

6.4.2 Rural Area

The pattern of the Rural results differs from that of the Urban results. This is surprising since the Rural findings in the analysis of mean plaque and calculus levels and Treatment needs were similar to the Urban findings.

There are certain similarities in these Rural results. The findings expected due to the design of the criteria are recorded in the "No Treatment", O.H.I. only, and Perio. groups, but the Cons. and O.H.I. only group does not show a significant difference between the mean periodontal index values.

12.6.4.2/ Those requiring Extns. had a higher mean periodontal index value than those who did not ($p<0.001$), but the Part Dents. group did not record the same relationship as was established in the Urban area.

Those requiring Ortho. also had a higher mean periodontal index than those who did not, in the Rural area ($p<0.01$). The subjects who required Cons. had a higher mean periodontal index value than those who did not. ($p<0.001$). This was not found in the Urban area. In fact the Rural value for this group (1.02) is higher than any Urban group except Full Dents. The only explanation of a link between gingivitis and a need for Cons., as found in the Rural results, is an increased number of cervical cavities. These cavities act as stagnation areas, and encourage the accumulation of bacterial plaque, and thus, an increase in gingivitis.

In this area, the highest recorded mean periodontal index value was also in the Full Dents. category.

6.4.3 Conclusions

It would seem that children requiring Extns. have a high level of gingivitis. This is almost certainly due to higher levels of plaque found in this group of children (Table 36), and it is

12.6.4.3/ interesting to speculate whether this plaque is also the cause of the caries necessitating the extractions, or whether it is a result of open, carious cavities causing an increase in the oral flora.

There is also a strong trend for those requiring Part Dents. to have more gingivitis (significant difference in Urban area only). This is easier to understand when it is remembered that many subjects were placed in this group if they required replacement dentures.

Table 38 shows, in both areas that no group was free of gingivitis. In the "No Treatment" group, some children had an occasional inflamed papilla which the examiners felt was transient in nature, even although it satisfied the criteria for Code 1 of the periodontal index.

12.7 MAIN CONCLUSIONS AND DISCUSSION

The following are the main observations that have been made in this study of treatment needs.

1. No treatment was required by 0.58% of the Urban sample and 2.34% of the Rural sample.

2. Extractions for caries were required by 31.09% of the Urban sample, and 24.22%

12.7/ of the Rural sample.

3. A higher percentage of the upper social group (Social Class 1 and 11) required no treatment (Rural) or O.H.I. only (Urban).

4. A higher percentage of the lower social group (Social Class 111, 1V and V) required Extns. (Urban) and Part Dents. (Rural).

5. Other than 3. and 4. above, no firm relationship exists between social class and treatment needs, particularly if a five-band social classification is used.

6. Using a toothbrush at least once per day reduces the need for treatment.

7. The best daily frequency of toothbrushing is either twice or three times per day.

8. Children requiring no treatment, or O.H.I. only, had better toothbrushing frequency patterns than those requiring Perio. or Extns.

9. No clear relationship exists between the number of snacks per day and the need for treatment.

10. Children who spend larger than average amounts of money on sweets are more likely to need Extns. and Part Dents.

12.7/ 11. The groups of children requiring no treatment, or minimal treatment, had a lower caries experience than the total sample, whereas those requiring Extns. and Part Dents. had a higher caries experience.

12. Children with worse levels of plaque required more treatment.

13. There is a direct relationship between the need for Cons. and Extns. and the amount of calculus.

14. Children requiring Ortho. had a higher level of gingivitis, and there was a definite trend towards more plaque, more calculus and a lower caries experience in these children.

There are no directly comparable studies in the dental literature, but a few reports have been published on treatment needs.

Sutcliffe (1966) (85) investigated the relationship between caries experience, as measured by D.M.F. and the nature of treatment already received. This study does not refer to treatment requirements, but the author refers to the placing of preventive fillings in second molar and premolar teeth. He feels that this could double the D.M.F. Index, and suggests that a partial D.M.F. reading based on approximal surfaces where preventive fillings are

12.7/ not placed, would avoid this false raising of the measure of caries experience. This is a sound argument but the method has not been used in any study, possibly because of the difficulty of examining interproximal surfaces without radiographs. The incorporation of preventive fillings in the D.M.F. index may account for the difficulty in analysis encountered in the Treatment Needs and mean D.M.F. section of this study. In view of the large number of children found to require fillings placed in carious teeth, it would seem illogical to open caries-free teeth to place prophylactic fillings when the time involved could be spent restoring carious teeth.

Fanning et al (1969) (40), studying 13-14 year-old children, reported that 48.5% of the subjects' teeth were decayed, with a mean D.M.F. of 10.50 for the study population. Decayed teeth constituted a mean of 7.15 of this caries experience level. Despite this amount of disease, 75.2% of the decayed teeth were untreated. Unfortunately, this cannot be translated into the number of children requiring fillings, but the major agreement between this study and the work of Fanning et al (1969) is this: there is considerable disparity between treatment requirements and the amount of treatment already performed.

12.7/ Beal and James (1970) (86) investigated the dental needs of 5-year-olds, and reported that, in 1225 children, there were 3543 fillings and 501 extractions required. This is equivalent to a mean 2.89 fillings and 0.41 extractions required per child. From information not tabulated in this study, the Scottish 14-year-old children required a mean 4.94 fillings and 0.68 extractions each. Although these studies are not directly comparable, this could be taken to mean that, in 9 years, a child develops 2.05 fillings and 0.27 extractions more than can be treated! Pickles (1970) (87) surveyed a population of 6-18 year-olds for caries prevalence, and compared his survey findings with the clinical findings of those who later sought treatment at a health centre. His aim was to find if clinical care needs could be predicted from survey data. He found that primary teeth decayed data could be useful in predicting the gross restorative needs diagnosed clinically, but that the data for permanent teeth were not of such practical value. This work contains no reference to the numbers of teeth, or of children, requiring treatment.

Scheinin, Honka and Kankunen (1970) (88) examined 394 students in Finland, and reported an average of 13.62 surfaces requiring filling, and

12.7/ an average of 0.29 teeth requiring root-canal therapy per subject. These workers estimated that each student required 4 hours 58 minutes of treatment time. When the need for plaque control, further periodontal treatment and prosthetic requirements was taken into consideration, it was found that the total time required to treat each student was 8 hours 39 minutes.

Some simple further calculation reveals that it would require 97.4 weeks of one dentist's time (based on a 35 hour week) to complete the dental treatment of this small group of Scandanavian students, irrespective of any further dental disease that they may develop.

The following chapter will investigate the financial and manpower requirements necessary to undertake the treatment of the children studied in this report.

CHAPTER 13. THE CONTROL OF CURRENT DENTAL DISEASE

13 THE CONTROL OF CURRENT DENTAL DISEASE

The children in this study were 14 years of age at the time of examination. They are now a little older, and it is likely that their dental health is a little worse. In the Urban area, where dental care is relatively easy to obtain, it has been shown that only 0.58% of children needed no treatment, and 84.51% needed fillings. In the Rural area, where dental care is a little harder to obtain, it has been shown that 2.34% of children needed no treatment, and 91.25% needed fillings. These two examples of the dental requirements of children are distressing, and are not encouraging signs for the dental health of the future adult population.

13.1 THE STATUS QUO

The current approach within the dental profession, with regard to improving this difficult situation can be summarised as follows:-

1. In the survey areas, no preventive measures have, or are being, implemented on a community basis. If dental health campaigns have been held, the results of this survey show that they have been a failure. This includes the "Dental Health Pack" issued by the Scottish Home and Health Department through the local authority

13.1/ dental service, to all new entrants to primary schools.

2. The above comments could well apply to the whole of Scotland, with the exception of a few projects which are mainly experimental.

3. Manpower is generally considered to be insufficient to cope with the present levels of dental disease, without contemplating community-wide preventive measures. This will be discussed in Section 13.4.

4. There is little co-ordination between the two main dental services dealing with children. Reference has already been made in Chapter 9 to the doubtful fate of a child when the parent opts out on the child's behalf, of the dental service provided by the local authority. Too often, a child's treatment requirements are stated, and, the same child's next appearance at a dental surgery is for relief of pain from a previously-diagnosed carious tooth.

13.2 THE SIZE OF THE PROBLEM. A PRACTICAL VIEWPOINT.

In Paisley, where the Urban sample was examined, each child had a mean of 5.56 decayed, but restorable, teeth, and a mean of 0.82 unrestorable, carious teeth. (These figures are

13.2/ taken from the Penetration Scores results. These results are not discussed in this study) In the Paisley area, where the sample was a random third, this represents an approximate total of 25,750 fillings and 3800 extractions that are required in the total 14-year-old population in Paisley.

In the County of Banff, where the Rural sample was examined, the mean number of teeth requiring filling was 4.32, and requiring extraction was 0.53. Thus, in Banff, where the sample comprised all 14-year-olds, 2750 fillings and 350 extractions are required by this age group.

The following table summarises these calculations.

	Paisley	Banff
Fillings required.	25,750	2,750
Extractions reqd.	3,800	350

13.3 THE COST OF TREATMENT IN THE STUDY SAMPLES

3.1 The General Dental Services

The following information is taken from the Annual Report of the Scottish Dental Estimates Board (1971), and relates specifically to the 5-15 age-group.

13.3.1/

1. Number of Permanent Fillings..772,702.

   Cost of above item £788,676

   Approximate Cost per Filling £ 1.02

2. Number of Extractions of Permanent Teeth..... 101,721

   Cost of above item £ 51,311

   Approximate Cost per Extraction £0.50

If the fillings and extractions calculated in Paragraph 13.2 were to be completed, it would cost £28,000 in Paisley, and £3,000 in Banff, a total of £31,000. To put this figure in its proper perspective, one must look at the total cost of treating children in the general dental service. For those aged 5-15 years, this was £2million in 1971. Thus, to treat caries in this sample of 2184 children, aged 14, would require about one sixtieth of this expenditure. These children would also require periodontal treatment, dentures and orthodontic treatment and there are about 970,000 other Scottish school children.

Thus, much more government spending, probably in the region of ten times the above figure of £2millionwould be required to treat dental disease in all children.

The total cost of National Health Service dentistry was £10,000,000 in 1971, for all ages in

13.3.1/ Scotland. A superficial examination of the expenditure shows that at least half of this figure was spent on treating caries, periodontal disease, removing plaque and calculus, and making first sets of dentures. Caries, Periodontal disease and tooth loss are all preventable. Oral hygiene can be controlled by the individual. (see Chapter 2, para 6) This study shows that there is no prospect of dentistry costing the government less in future. How much money will the government have spent on the group of children examined in this survey, by the time they reach the age of 50? How many of these subjects will still have their own teeth? These are rhetorical questions, but the answere to them must be very depressing.

3.2 The School Dental Service

So far, the discussion has centered on the general dental service. The school dental service plays a large part in the dental care of children. The results of this study show that this service would appear to be effective, particularly where it is the predominantly available service, e.g. in Rural areas. Since this is a salaried service, it is not possible to estimate the cost of treatment of the children reported in this survey. It would, most likely, be a similar sum to that estimated for the general dental service. There

13.3.2/ are fewer school dentists, and their average salary is less than the target income of general practitioners, and so the service costs less to run, but their "productivity" (in terms of treatment performed) is less, for several reasons, viz:-

1. A high output of treatment is not necessitated, as it is when payment is by item of treatment.

2. There are too few school dentists for the total number of school children.

3. There are other responsibilities, e.g. health education, mothers, and pre-school children.

4. Administrative difficulties arise when the dentist has to go to the patient, as is often the case. Time is spent shifting mobile units, and arranging that certain ages of children be available.

Despite these difficulties, it is certain that the school dental service could undertake the treatment needs discussed in this study, most efficiently. Certainly, in the re-organised Health Service (see Chapter 14) the school dental service should be responsible for the application of the recommendations put forward in the final chapter of this study.

13.4 CAN THE PROFESSION COPE WITH THESE TREATMENT REQUIREMENTS?

Having shown the enormous cost of treating this small group of children, it is pertinent to ask if the dental profession could cope with the task, although the results of this study stand as evidence that it is not coping with it at the moment.

To assess the manpower needs, several assumptions have to be made:-

1. A 35 hour working week per dentist.

2. Each filling takes an average of 15 minutes. (This is purely a theoretical assumption, but it is intended to compensate for the fact that often, more than one filling is done per visit, and for all extra surgery time, e.g. two fillings on separate visits may take a total time of 35 minutes, whereas two fillings on the same visit may occupy only 25 minutes).

3. Each extraction takes 5 minutes, on the same assumptions outlined in (2) above.

4. Each child needing treatment is available to the dentist.

13.4/ From these assumptions it can be calculated that a dentist is capable of 140 fillings per week, or 420 extractions per week. (see NOTE).

NOTE. These calculations are likely to be gross over-estimations. The Annual Report of the Local Authority Dental Service (1971) shows the following facts.

Number of permanent teeth fillings in school children....	342,324
Number of half-days spent in treating school children.....	83,722
Number of fillings/half-day.....	4
Number of fillings per week.....	40

Similarly it is also possible to calculate that the local authority service extracts 4 permanent teeth from school children per week. These figures are not intended as criticism of this service, since it has already been pointed out that it is responsible for many other aspects of dental care, and for several other groups of the population.

Paisley children, aged 14, require 25,750 fillings and 3800 extractions (Paragraph 13.2). It would take one dentist 184 weeks to complete these fillings, and a further 9 weeks to complete the extractions...a total of 193 weeks spent

13.4/ exclusively treating caries in 14-year-olds! In Paisley, at the completion of the survey period, there were 24 dentists available in Paisley; it would take this team of dentists 8 weeks to complete this treatment alone.

Similar calculations reveal that in the County of Banff, it would take one dentist 21 weeks to complete the treatment of caries in all the 14-year-olds. The 10 available dentists would take 2 weeks to complete this task.

Thus, the Rural area would appear to be in a better position. Practically, however, no area can afford to have its total dental manpower committed to a single task, and no suggestion will be made in this report that the above approach should be undertaken. These calculations have been outlined to show that there is only one conclusion that can be made; there is not enough manpower available to undertake the estimated amount of treatment in one age-group of Scottish children.

13.5 THE PROFESSIONS CRITERIA FOR DENTAL HEALTH

There are many reasons for the outstanding amounts of treatment found necessary in this survey. Among these reasons are the shortage of manpower, and poor dental attendance by the children. However, it is also possible that the epidemiologists

13.5/ who performed the examinations in this survey, establish a very high standard of dental health as the "normal". The examiners' impression of health certainly differs from that of a large number of other Scottish dentists, as the following figures show.

Percentage of children requiring no treatment, or oral hygiene instruction only, in this survey (age 14).....7(average)

Percentage of children regarded as "dentally fit" at 15 yrs. by school dental service. .....20(average) (from Annual Report)

This is a surprising discrepancy. There is no possibility that the 13% difference noted above could be accounted for by treatment performed during the 1 year age difference. Thus, it must be concluded that the standard by which the school dental service defines "dentally fit" is not as high as the standard for "No Treatment" or "Oral Hygiene Instruction Only, Required" adopted in this study. There is no logical reason for this difference in standards. The poorer standard adopted by the school dental service is possibly the result of circumstances. Thus, "dentally fit" should be regarded as "as dentally fit as possible, given the shortage of dentists, and the number of children that require treatment".

13.6 CONCLUSIONS

There is only one major conclusion to be made from the discussion in this chapter. Complete satisfaction of the dental treatment needs of children, which are indicated by this sample study, is impossible, financially, and with the available resources of manpower. The dental profession must resign itself to another generation of adults with dental disease, or dentures.

CHAPTER 14. RECOMMENDATIONS FOR THE FUTURE

14.1 THE NEED FOR CHANGE

The previous chapter has shown that the dental services could not hope to complete the treatment of the dental disease present in all Scotland's children. This study is the first Scottish epidemiological report to concentrate on treatment needs and to estimate the ability of the dental profession to undertake these treatment needs, but it is not the first report to put forward recommendations for the profession's future, in Scotland, or in the whole of the United Kingdom.

It has recently been stated "We can go on having the reputation of being the world's most toothless nation, and paying out some hundreds of millions of pounds each year as the price of distinction, or we can start to take teeth seriously". (89)

The article about dentistry, from which this quotation is taken, was "A Policy for Change" and was one of a series which examined the social services. The article concluded with six recommendations including the abolition of dental charges, compulsory fluoridation, and increased emphasis on health education.

Very recently, a Working Party of the British Dental Association has reported on Dental Care for

14.1/ the Community (90). As a preface to its recommendations this report states:-

> "In recent years many surveys have demonstrated the extent of the problem which the community and the dental profession face. The British Dental Association urges that a co-ordinated effort on the part of many bodies concerned with dental health as well as the dental profession is essential if it is to be solved." (90)

There are ten recommendations in this Working Party Report and these include mandatory fluoridation, free issue of fluoride tablets as an interim measure, increased training of hygienists, increased research in dental health education, and the allocation of more Government money to dentistry.

14.2 THE RE-ORGANISATION OF THE SCOTTISH HEALTH SERVICES

In the past, administrative and practical changes in the dental profession have been suggested but never implemented. One suggested administrative change will take place soon, and this is the re-organisation of the Health Services in Scotland. The Government White Paper (July 1971) (91) states that this reform is a means of enabling doctors, dentists and other health workers.....

14.2/ "to work together with greater ease and effect for the benefit of their patients and the whole community."

The proposals outlined in the White Paper have since been passed as an Act of Parliament, and it is likely that the new structure will be in operation by April, 1974.

14.3 DENTISTRY IN AN INTEGRATED HEALTH SERVICE

The Secretary of State for Scotland has set up a Working Party, under the chairmanship of Dr. J. L. Trainer, to consider the role of dentistry in an integrated health service. This Working Party has recently published its report. (92). This report is the major document concerning the immediate future of Scottish dentistry; the epidemiological results presented in this thesis reveal a considerable problem for the dental profession in Scotland in the future. It is, therefore, worthwhile considering how the re-organised dental profession can approach the problem of child dental health outlined in this study.

14.4 MAIN POINTS FROM THE WORKING PARTY REPORT

Many of the possible recommendations of this thesis are already outlined in the Report of the Working Party on the Integration of the Dental Services. These are the recommendations concerned with the need for the profession to undertake a

14.4/ programme of prevention of dental disease. These points are extracted from the report and listed below for further discussion.

4.1 Re-organisation affords an opportunity for the re-assessment of the way in which manpower and other resources should best be deployed within the integrated service to secure improvement in dental health, for example, by concentrating more on prevention and by dealing with children at a very early age, and by the increased use of suitably trained and supervised ancillary staff. (paral.5).

4.2 The role which general practitioners play may need to be extended to provide a greater emphasis on prevention, and on the dental health of children. (para.2.3.).

4.3 The responsibility (for the local authority dental service) is being transferred to the Secretary of State, and will be exercised in the main by the Health Boards on his behalf. (para.4.1)

4.4 There is a need for expansion of the services (local authority) not least to allow for a greater concentration on prevention...The clinical responsibilities for child dental care might best be met by teams including auxiliaries, hygienists and surgery assistants under the leadership of dentists. (para.4.3)

14.4.5 At the area level, the Health Board must assume responsibility for the assessment of the extent of dental disease, so that the needs of the population can be determined and the priorities for prevention and treatment can be established. (para.5.2)

4.6 He (the Chief Administrative Dental Officer) will be concerned with...dental health education, with securing that priority groups within the community are provided for, and more generally, with ensuring that dental services are adequate, and trying to effect improvements in dental health and services by further integration and otherwise. (para.5.4)

4.7 ....one of the possibilities that merits fuller consideration is the increased use of ancillary workers to provide assistance in both clinical and non-clinical work. (para.6.1)

(Note: future reference to paragraph numbers will be to the numbers used in this thesis, and not to the Working Party Report numbers which appear in parenthesis above)

14.5 FUTURE POLICIES FOR PREVENTION

The dental profession in Scotland cannot continue to accept a situation in which 14-year-old children require such large amounts of treatment as indicated in this report. The re-organised health service must adopt a new policy for children's

14.5/ dental health. It is suggested that each new Area Health Board institutes a "Task Force" with the sole remit of improving the dental health and treatment requirements of children within a given period of time, say, ten years. (See para.14.4.1) The staffing for such a team should be drawn from the local authority dental service (see para. 14.4.4) and should, ideally, consist of one dentist and a team of dental ancillaries. This "task force" should have minimum responsibility for performing items of dental treatment, and maximum responsibility for the application of clinical preventive measures and for health education. Burt (1971) (93) in an assessment of the future needs of the local authority dental service feels that it is possible that mass school dental inspections could soon be a thing of the past. This author poses some questions that he feels need answering, and among these is the question "Do school inspections by themselves stimulate children to seek dental care?" The answer to this question is most likely to be "No", and an essential part of any future policy must be to encourage an understanding of the value of a healthy mouth at as early an age as possible, and take steps to avoid negative influences that are liable to upset this plan. The most common source of this type of influence is from parents and grandparents who

14.5/ translate their own dental experiences to a child.

5.1 Manpower needs

Two contradictory facts create a problem about developing a preventive dentistry "task force" in each Area Health Board. Firstly, prescribing preventive measures is clearly the responsibility of the dental profession, and of qualified dentists; secondly, there are insufficient dentists. On this basis there are two immediate needs. Firstly, there is a need for dentists to decide on the priorities of their abilities. Do they treat disease or prevent it? Secondly, there is a need for more dentists; this will be discussed in a later section.

The priorities of the profession must lie with those children who have not yet had a chance to develop dental disease i.e. the very young, and the infant school child. If the profession, as it exists today, is to make any attempt to solve its largest problem, that of child dental health, then other groups in the community must be satisfied with a less efficient service. Otherwise, at least 28% of 14-year-old children in future years will still need extractions and 85% will still need fillings.

In instituting a team of professional persons to reduce the level of dental disease in any given area it is clear that maximum use must be made of ancillary staff. (See para.14.4.7) The following

14.5.1/ further recommendations are made concerning manpower for prevention.

1.1 Dentists

It is quite clear that the responsibility for the prescription and administration for the preventive and educative measures must lie with a qualified dentist. If ancillary staff are employed then a chain of command may be established since supervision is required in the field. An ad hoc committee of the British Dental Association (1972) (94) examining the future of children's dentistry, suggest that the salaried dental service for children should be under the direction of a designate dental surgeon, who should be of wide professional experience in clinical dentistry, and public health dentistry. He should have the necessary qualities of leadership and management, and will be responsible for overall dental policy, liason with education authorities, and co-ordination of services with his dental and other professional colleagues. Whether these qualities are to be interpreted as those of the chief administrative dental officer (C.A.D.O.) of the Area Health Board is not made clear, but this author feels that the dentist leading the preventive dentistry "task force", as suggested, should not be the C.A.D.O.

14.5.1.2 Ancillary Staff

Much has been published about the use of ancillary staff. The New Zealand Dental Nurse is perhaps the best known ancillary dental worker. The "nurse" is in fact an expanded duty dental auxiliary and these girls form a service, established more than 50 years ago, which performs rigidly prescribed duties of an examination and treatment nature. This service has been remarkably successful in controlling the dental health and attitudes of New Zealand children, and the benefits are carried into adult life. (Friedman, 1972: Dunning, 1972) (95,96)

Trainer (1972) (97) has made some comments, with which the present author agrees, on the value of using dental auxiliaries, as trained in the United Kingdom, in a programme of preventive dentistry. The maximum utilization of these personnel, as in New Zealand, is in a treatment capacity. They do receive training in health education, and are invaluable in any dental treatment service. However, the British dental profession has had, and perhaps still has, reservations about accepting dental auxiliaries. The same happened in New Zealand, where it took time for the Auxiliary dental service to be fully accepted and for the improved dental health and attitudes that they produced to be realised. Possibly, the United

14.5.1.2/ Kingdom dentists also need time. Of the 228 auxiliaries in service in 1971 only 16 are practising in Scotland.

The dental hygienist is trained to maintain a high standard of dental health and cleanliness in her patients by scaling, polishing, and health education. She is also capable of applying topical fluoride solutions, and is, overall, more orientated towards prevention than treatment. The value of the preventive measures was discussed in Chapter 2, para.6. Personal experience of the author shows that most hygienists are not utilised to the full extent of their training, especially in health education work. Hygienists can be trained in one year, and there is one training school in Scotland, and 27 hygienists are employed in the country. McKendrick (1970) (98) has shown that hygienists and dentists together can successfully institute a programme of incremental dental care.

The dental surgery assistant, although primarily trained to be the dentist's assistant in the surgery, is, in the author's opinion, capable of contributing to a preventive programme. In dental health education, a capable surgery assistant using good material can be a considerable asset to any team. The present survey (Chapter 9) has shown that up to 58% of children needed a lesson on oral hygiene.

14.5.1.2/ It is considered that the concept of a "task force" requires some development of the abilities of currently available anciliaries. It is evident that the dental hygienist is the person with most of the necessary skills but some development would be necessary. Since more ancillary workers must be trained it is recommended that their duties should be expanded to include the use of fissure sealant. It should be possible to train a suitable person to apply fluoride gels, to supervise fluoride rinsings, to apply fissure sealants, to scale and polish the teeth, and to teach dental health in less than the two years it takes to train a dental auxiliary. Trainer (1972) (97) suggests similar changes in the job-definition of ancillary workers, and suggests that this type of dental health personnel could be trained in two grades, one as a preventive worker, and the other as a clinical operative similar to the Dental Hygienist. The preventive dentistry personnel could be known as Dental Therapists, and it is recommended that urgent consideration be given to the training of this type of personnel in Scotland. This would allow the full implementation of the envisaged "task force" of preventive ancillary workers creating a team under the specific control of a dental surgeon, the whole team having no responsibility for restorative dental treatment.

14.5.1.2/ Until such time as preventive ancillary personnel are available any preventive dentistry units that the Area Health Boards care to set up will have to be staffed by dentists and such Auxiliaries and Hygienists as are available. This will, of course, reduce the amount of treatment available to other sections of the community.

Should such a training scheme for preventive ancillaries be established, serious consideration should be given to an adequate career structure, and also to fixing a minimum period of post-training employment in the form of a pre-registration period. In today's enlightened society, it is surely not out of the question to provide incentive for a professional person, trained at Government expenses, to give at least some service to the community. This is done in the teaching profession, and encourages young women to continue working for a period, at a time when marriage is most likely.

5.2 CLINICAL PREVENTIVE MEASURES

There are several clinical measures which have been shown to reduce the level of dental disease, and which could be prescribed by a dentist/ancillary preventive team. These methods are well known to the dental profession, and are fluoride rinsing programmes in schools, fluoride tablets for pregnant

14.5.2/ women and children, topical fluoride gels, fissure sealants, and scaling procedures. (See Chapter 2, para.6) There are numerous reports in the dental literature showing the reduction of dental disease produced by implementing any one of these measures. All of these measures should be carried out by ancillary workers, and would enable future surveys to report a higher percentage of children requiring no treatment than the 1.46% reported in this study. It should, however, not be a prime responsibility of a preventive dentistry team to promote water fluoridation. This must be the foremost duty of the whole dental profession, since water fluoridation is the cheapest and most effective method of reducing dental caries.

5.3 Dental Health Education

Many committee and conference reports have been produced about dental health education, and all dentists would probably agree that it is an essential part of the treatment of any age of patient. However, no aspect of the dental profession has met with more consistent failure, as the treatment needs reported in this survey show. Advice about diet, oral hygiene and dental attendance is not being followed; if it was, 85% of the subjects would not need fillings. (See Chapters 9 and

14.5.3/ A wealth of material is available from many sources but has been described as "stereotyped and S.O.S. -- same old stuff" by one American conference. (Bivins and Lucye, 1969) (99). Much of the trouble stems from the fact that dental health education is often undertaken by amateurs who have no understanding of the basic processes involved. Health education is a difficult task since it involves both education and motivation in an attempt to change a person's behaviour pattern. One of the clearest papers to have been published on the subject (Yudkin, 1969) (100) states...

> "most of us believe complacently that health education consists merely in telling people what is good for them; we believe our job is finished when we have told them about the causes of dental decay."

Yudkin also refers to persuasion. Persuasion and motivation are almost synonymous, and either of these activities are much easier to attempt if the end point of the persuasion or motivation results in pleasure or prestige. As examples it is evident that children do not need much persuasion to buy confectionery, and are always keen to try the latest brands which are excitingly advertised on television, nor is it difficult to understand how someone can be persuaded or motivatedto part with a

14.5.3/ considerable sum of money for a luxury item that few of his acquaintances own.

Motivation is an interaction between drive and reinforcement. (101) Drive is dependent on belief, not feeling, and belief is affected by knowledge. Thus, sound educational dental health material can be expected to provide drive. Reinforcement is provided by environmental incentive, i.e. others in the community are doing the same thing. Thus as far as dental health is concerned, enough people have to be provided with drive to provide environmental incentive for the rest of the community. This is basic psychology, and it is a lack of knowledge of these principles combined with a lack of knowledge of educational technology that condemn current dental health material to failure from the start. Careful thought and research is necessary to provide any preventive dentistry team with the right material and instruction in the correct approach to a subject before dental health education could be shown to be as successful as clinical measures.

Dental health education can ensure that attitude changes are developed in the people who will have good teeth by the time they reach adulthood, if clinical preventive measures are applied to them as children. It is important also that parents and grandparents are asked not to interfere

14.5.3/ with the dental progress of any child, since this is often the predominant factor in determining a child's attitude to his mouth.

It was recommended in paragraph 14.5.1.2 that Preventive ancillaries be trained, among other things, to be able to carry out successful health education, once provided with good material. Knittel, Child, and Hobgood (1971) (102) have outlined the following roles for a health education aide:-

1. One who helps to overcome native superstitions and beliefs which impede modern health practices through education and demonstration.

2. One who helps people overcome apathy or inertia to adopt good health practices and to take advantages of existing health services.

3. One who supports professional health people performing routinized tasks which assist in attaining health professionals' goals.

The current state of children's teeth would indicate that the dental profession badly needs just such a person. A health education aide could do much to reduce the plaque, calculus and gingivitis

14.5.3/ levels reported in Chapter 9.

5.4 Other Recommendations

The preceding part of this chapter has dealt with recommendations specifically orientated towards the forthcoming changes in the structure of the Scottish dental services. This paragraph puts forward some further general recommendations.

It is clear that the dental profession must continue to press for the introduction of measures to correct the level of fluoride in the public water supply since substantial evidence shows that this is a beneficial measure. (Chapter 2)

Greater liason is required between the local authority dental service, now, and in the re-organised health service, and the general dental service. (para.14.4.2) It should be possible, administratively, to ensure that no child goes without dental care, even if the parent insists in not co-operating with the school dental service. If a preventive dentistry "task force" is established in the future, then all general dental practitioners should be informed of its progress, and preferably of the names of children who are normally under their care, who have been included in a programme of prevention. Evaluation of such a preventive programme is essential but would become difficult if the amount of treatment received by a child was

14.5.4/ unknown. For example, random placement of "prophylactic fillings" could completely upset the effect of any measure designed to prevent decay.

The dental profession must make greater efforts in recruitment, both into degree courses in dentistry and into the ancillary services. It is surprising that the profession does not have a full-time careers officer. Dentistry still relies on recruiting from those who have a pre-conceived desire to become a dentist, or from those who have a general interest in medicine and dentistry.

14.6 GENERAL SUMMARY

This has been an epidemiological study of two samples of 14-year-old Scottish Children. It has revealed high levels of dental disease, and high numbers of children requiring treatment, both of which were slightly worse in a Rural area, and neither of which were substantially affected by the socio-economic background of the child's home. 1.46% of the sample required no treatment, but 87% needed fillings, 27% needed extractions for caries and 37% needed periodontal treatment.

It is unlikely that this situation will ever improve until preventive measures are instituted, and health education is improved. Thus, the dental health of the average adult over the age of 30 will still be very poor in the year 2000.

14.6/ Recommendations have been made to allow the dental profession to reduce the amount of dental disease in children in the immediate future. These are:-

1. The institution of a "task force" in each Area Health Board, with the prime responsibility of applying the best preventive measures to all children within their jurisdiction.

2. The training of a new type of ancillary dental personnel - the preventive ancillary - as a specialist in preventive techniques, to form the main personnel for use in such a "task force".

3. The greater use of current methods of dental health education.

4. Further urgent research in health education technique and method, for use in the envisaged preventive team.

5. Continued support for water fluoridation.

6. Concerted effort and co-ordination in dental recruitment.

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SUMMARY OF THESIS

It is well known from epidemiologists' reports and from Government statistics that the state of children's dental health is poor. What is not known is the numbers of children who require various forms of treatment, and whether or not the available dental manpower will ever cope with the situation. To elicit this information is the general purpose of this investigation, which is the first study to examine treatment needs in such detail.

The study is based on the results of a dental epidemiological survey carried out during the period 1968-1971. The specific aims of the study are as follows:-

1. To assess the dental treatment needs of fourteen-year-old Scottish children.

2. To discover possible differences between the dental status and treatment needs of children living in an Urban environment, and those living in a Rural environment.

3. To discover possible effects of social class, and of dental attendance habits on dental status and treatment needs.

4. To study the relationship between treatment needs and toothbrushing, snack-eating, and spending on confectionery, and between

treatment needs and caries experience, oral cleanliness and periodontal disease.

5. To estimate the ability of the currently available dental manpower to control the level of dental disease recorded in this survey.

6. To make recommendations for the control of dental disease in children in the immediate future.

The fieldwork of this study was carried out by the author, with the assistance of a colleague, in one town and one county in Scotland. The town of Paisley was taken as representative of an Urban area, and 1544 subjects were examined in this area over a three year period. The County of Banff was taken as representative of a Rural area, and 640 subjects were examined in this area in one fieldwork period. The level of fluoride in the water supplies in both areas was similar, and the dentist-population ratios were 1:4300 in Paisley and 1:5500 in the County of Banff.

This study reports one of the highest values for the mean number of Decayed, Missing and Filled (mean D.M.F.) teeth that has ever been recorded in a school age population. This is 11.47 and relates to the Rural area where the caries experience (mean D.M.F.) is higher than in the Urban area. Rural children have more fillings per subject, but Urban children

have less plaque, less calculus and less gingivitis per subject than Rural children. These last findings are, however, only relative since the oral cleanliness of the Urban sample is poor, and the level of gingivitis is fairly high. Overall, 8.5% of the Urban sample, and 5% of the Rural sample required no treatment or only a lesson on oral hygiene. More Rural children needed fillings, and this is consistent with their higher mean D.M.F. Fewer Rural children needed extractions for caries or orthodontic treatment. This could be due to the available Rural dental services restoring teeth at an earlier stage, and anticipating crowding.

The difference between the Urban and Rural communities is quite clear. Urban children have better toothbrushing and snack-eating habits, a lower caries experience (mean D.M.F.), better oral cleanliness and less periodontal disease. Urban children have better dental health than Rural children. Rural children have more fillings, and need fewer extractions and less orthodontic treatment than Urban children. The Rural dental service would thus appear to be the more efficient of the two.

The effects of social class were measured by distributing the sample, according to the social class of each subject's father, into five social classes. The dental status findings and treatment needs were

then examined in each social class. A large number of significant differences were found, but no clear pattern emerged. These results are discussed, but it is felt that dividing a population into five social classes is no longer accurate in Britain's changing society. A second analysis is carried out, by dividing the sample populations into an upper and lower social strata. This had a more consistent effect on the results of the survey. The analysis shows that upper social strata children have fewer decayed and missing teeth, and more filled teeth than those in the lower strata, in the Urban area. Again, in the Urban area, upper social strata children have a better oral cleanliness. Only filled teeth follow this pattern in the Rural area. In both areas mean D.M.F. and periodontal disease are unaffected by this method of social classification. Treatment needs are not greatly affected by this socio-economic grouping of the population.

It is shown that children who claimed to have a dentist have a higher caries experience (D.M.F.) than those who do not. This is also shown for those who claim to attend their dentist regularly. Both of these findings are shown in each of the sample areas. Regular dental attenders have better oral cleanliness and less periodontal disease, and need less treatment. The results show that even

regular attenders need considerable treatment to complete their dental fitness.

A detailed study of treatment needs is made. It is shown that the section of the study population who brushed their teeth at least once per day need less treatment. No clear relationship exists between snack-eating and treatment needs, but those children who spent larger than average amounts of money on confectionery are more likely to need extractions for caries, and partial dentures. The children who need the most severe forms of treatment (extractions and partial dentures) have the highest levels of plaque. Children who required orthodontic treatment have a higher level of gingivitis and there is a definite trend towards more plaque, more calculus and a lower caries experience (D.M.F.) in these children.

In association with the results of this study, financial and practical considerations are presented to show that the dental profession cannot hope to cope with the reported levels of dental disease. To expect the current limited manpower to institute effective preventive measures at the same time is regarded as impossible.

Recommendations are made, which, if acted upon, would constitute a more practical approach to the

reduction of dental disease in children. Among these suggestions are:- the development of preventive dentistry units in association with the re-organisation of the National Health Service: the training of preventive ancillaries to promote dental health among school children: the re-orientation of the task of the dentist to allow priority care to be available to children, this care being prescribed by the dentist and applied by the ancillaries who staff the preventive dentistry units: continued support by the dental profession for water fluoridation: co-ordination and organisation of recruitment into the dental profession. These recommendations formulate a plan which would allow the majority of dentists to continue undertaking treatment and yet would encourage the prevention of dental disease on a community basis.

DENTAL TREATMENT NEEDS IN TWO SAMPLES OF SCOTTISH FOURTEEN-YEAR-OLD CHILDREN

by

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VOLUME II
(Tables)

A Thesis Presented to the University of Glasgow for the Degree of Master of Dental Surgery

December 1972

	PAISLEY	BANFF
MALES	713 (46.18%)	340 (53.13%)
FEMALES	831 (53.82%)	300 (46.87%)
TOTAL	1544	640

TABLE 1. NUMBERS OF SUBJECTS EXAMINED IN EACH AREA

	PAISLEY				BANFF			
SOCIAL CLASS	MALES	FEMALES	TOTAL	+	MALES	FEMALES	TOTAL	*
NOT KNOWN NOT APPLICABLE	15.71	17.01	16.45	-	14.41	13.33	13.9.	-
1	2.95	1.56	2.20	3.40	2.06	1.00	1.56	1.35
11	15.99	15.52	15.74	10.45	16.76	21.33	18.91	22.86
111	45.16	48.39	46.89	53.37	45.88	43.67	44.84	35.13
1V	14.45	14.32	14.38	18.77	18.53	15.67	17.19	32.17
V	5.75	3.13	4.34	12.59	2.35	5.00	3.59	6.41
COMPARISON WITH CENSUS	±8%	±7%	±8%	-	±13%	±17%	±15%	-

\+ Figures from 1966 Census - Central Clydeside Conurbation

* Figures from 1966 Census - Banff County

TABLE 2. PERCENTAGE DISTRIBUTION BY SOCIAL CLASS OF SUBJECTS IN EACH AREA

	URBAN			RURAL		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
WITH BRUSH	95.93	99.40	97.60	95.59	100	97.66
WITHOUT BRUSH	4.06	0.60	2.40	4.41	0	2.34

TABLE 3. PERCENTAGE OF CHILDREN OWNING A TOOTHBRUSH IN BOTH AREAS

	URBAN			RURAL		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
NO BRUSH	4.06	0.60	2.40	4.41	0.00	2.34
1/DAY	34.50	29.56	30.76	33.24	39.00	35.94
2/DAY	22.30	54.99	39.90	10.88	41.33	25.16
3/DAY	1.82	6.74	4.47	1.47	4.67	2.97
LESS THAN 1/DAY	37.31	10.11	22.47	50.00	15.00	33.60

TABLE 4. PERCENTAGE OF CHILDREN BRUSHING AT EACH FREQUENCY IN EACH AREA

	URBAN			RURAL		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
MEAN AMOUNT	14.50	11.62	12.95	16.04	10.52	13.45

* Values in new pence

TABLE 5. MEAN AMOUNT SPENT ON SWEETS PER WEEK IN EACH AREA

URBAN			RURAL		
MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
81.77	91.94	87.24	72.94	74.33	73.59

TABLE 6. PERCENTAGE OF CHILDREN EATING SNACKS IN EACH AREA

	URBAN			RURAL		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
CARBOHYDRATE	79.42	75.13	76.99	88.31	82.51	85.56
NON-CARBOHYDRATE	20.58	24.87	23.01	11.69	17.49	14.44

TABLE 7. PERCENTAGE OF CHILDREN EATING DIFFERENT TYPE OF SNACK, IN EACH AREA

(100% = TOTAL NUMBER OF SNACK-EATERS)

	URBAN			RURAL		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
MEAN NO. OF SNACKS/DAY	1.60	1.65	1.63	1.26	1.13	1.20

TABLE 8. MEAN NUMBER OF SNACKS PER DAY IN EACH AREA

	URBAN			RURAL		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
MEAN NO.	5.33	5.20	5.26	5.16	4.53	4.86

TABLE 9. MEAN NUMBER OF DECAYED TEETH IN EACH AREA

	URBAN			RURAL		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
MEAN NO.	1.78	1.91	1.85	1.45	1.43	1.44

TABLE 10. MEAN NUMBER OF MISSING TEETH IN EACH AREA

	URBAN			RURAL		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
MEAN NO.	2.74	3.65	3.23	3.29	4.60	3.90

TABLE 11. MEAN NUMBER OF FILLED TEETH IN EACH AREA

	URBAN			RURAL		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
MEAN NO.	10.87	11.09	10.99	11.09	11.81	11.47

TABLE 12. MEAN NUMBER OF D.M.F. TEETH IN EACH AREA

	URBAN			RURAL		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
MEAN VALUE	5.87	5.35	5.59	6.28	5.38	5.86

TABLE 13. MEAN "DUNDEE" ORAL HYGIENE INDEX VALUES IN EACH AREA

	URBAN			RURAL		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
MEAN VALUE	.42	.35	.38	.49	.41	.45

TABLE 14. MEAN CALCULUS INDEX VALUES IN EACH AREA

	URBAN			RURAL		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
MEAN VALUE	.67	.67	.67	.87	.75	.81

TABLE 15. MEAN PERIODONTAL INDEX VALUES IN EACH AREA

	URBAN	RURAL	"p" VALUE
O.H. INDEX	5.59	5.86	< 0.01
RUSSELL INDEX	0.67	0.81	< 0.001
CALCULUS INDEX	0.38	0.45	< 0.001

TABLE 16. COMPARISON OF TOTAL SAMPLE MEAN ORAL HYGIENE INDEX, CALCULUS INDEX AND PERIODONTAL INDEX IN EACH AREA

	URBAN	RURAL	"p" VALUE
NO TREATMENT	0.58	2.34	< 0.001
O.H. INST. ONLY	7.90	2.81	< 0.001
CONS. & O.H. INST. ONLY	49.35	35.47	< 0.001
CONSERVATI	35.16	55.78	< 0.001
PERIODONTAL	27.01	47.34	< 0.001
EXTRACTIONS	31.09	24.22	< 0.01
PART DENTURES	7.84	5.16	< 0.05
FULL DENTURES	0.19	0.31	NS
ORTHODONTICS	53.37	32.03	< 0.001
SAMPLE NUMBERS	1544	640	

TABLE 17. PERCENTAGE OF CHILDREN REQUIRING VARIOUS FORMS OF TREATMENT IN BOTH AREAS

REGISTRAR-GENERAL'S SOCIAL CLASSIFICATION (1960)

	1	11	111	1V	V	TOTAL SAMPLE
TOOTHBRUSHING FREQUENCIES	NS	NS	NS	NS	NS	2xDAY
AMOUNT SPENT ON SWEETS/WEEK	$<^{-}_{0.05}$	$<^{-}_{0.02}$	NS	NS	$<^{+}_{0.01}$	12.68
NO. OF SNACKS/ DAY	NS	$<^{-}_{0.05}$	NS	$<^{+}_{0.01}$	NS	1.62
DO YOU HAVE A DENTIST? YES:	NS	NS	NS	NS	NS	87.91%
DO YOU ATTEND DENTIST REGULARLY? YES:	NS	NS	NS	NS	NS	58.55%

A. Results from Urban Area

	1	11	111	1V	V	TOTAL SAMPLE
TOOTHBRUSHING FREQUENCIES	NS	NS	NS	NS	NS	1xDAY
AMOUNT SPENT ON SWEETS/WEEK	NS	$<^{-}_{0.02}$	NS	NS	NS	14.17p
NO. OF SNACKS/ DAY	$<^{+}_{0.05}$	NS	NS	NS	NS	1.20
DO YOU HAVE A DENTIST? YES:	NS	NS	NS	NS	NS	87.67%
DO YOU ATTEND DENTIST REGULARLY? YES:	NS	NS	NS	$<^{-}_{0.01}$	NS	53.62%

B. Results from Rural Area

TABLE 18. SOCIAL CLASS AND DENTAL HABITS
Significant differences found between mean results in each social class, and total sample results. (NS - not significantly different)

SOCIAL CLASSES

	1 & 11	111, 1V & V	"p" VALUE
TOOTHBRUSHING FREQUENCY; 1/ DAY	14.44%	23.49%	< 0.05
AMOUNT SPENT ON SWEETS/WEEK	11.07p	13.12p	< 0.001
NO. OF SNACKS/ DAY	1.5	1.7	< 0.01
DO YOU HAVE A DENTIST? YES:	93.14%	86.48%	NS
DO YOU ATTEND REGULARLY? YES:	72.48%	54.45%	< 0.05

A. Results from Urban Area

	1 & 11	111, IV & V	"p" VALUE
TOOTHBRUSHING	NOT SIGNIFICANT AT		ANY FREQUENCY
AMOUNT SPENT ON SWEETS/WEEK	13.0p	15.7p	< 0.001
NO. OF SNACKS/ DAY	1.2	1.2	NS
DO YOU HAVE A DENTIST? YES:	89.31%	87.14%	NS
DO YOU ATTEND REGULARLY? YES:	61.54%	51.09%	NS

B. Results from Rural Area

TABLE 19. SOCIAL CLASS AND DENTAL HABITS
Comparison between children from non-manual and manual populations.

REGISTRAR GENERAL'S SOCIAL CLASSIFICATION
(1960)

	1	11	111	1V	V	TOTAL SAMPLE
D.M.F.	NS	NS	NS	NS	$< \bar{0}.05$	11.04
DECAYED TEETH	NS	$< \bar{0}.05$	NS	NS	NS	5.23
MISSING TEETH	$< \bar{0}.01$	NS	NS	NS	NS	1.84
FILLED TEETH	NS	$< \dot{0}.001$	NS	NS	$< \bar{0}.001$	3.45
"DUNDEE" O.H.	$< \bar{0}.05$	$< \bar{0}.01$	NS	NS	NS	5.56
CALCULUS INDEX	$< \bar{0}.01$	$< \bar{0}.01$	NS	NS	NS	0.39
PERIO INDEX	NS	NS	NS	NS	NS	0.62

A. Results from Urban Area

	1	11	111	1V	V	TOTAL SAMPLE
D.M.F.	NS	NS	NS	NS	NS	11.61
DECAYED TEETH	NS	NS	NS	NS	NS	6.05
MISSING TEETH	$< \bar{0}.001$	NS	NS	NS	NS	1.43
FILLED TEETH	NS	$< \dot{0}.02$	NS	$< \bar{0}.001$	NS	4.15
"DUNDEE" O.H.	NS	NS	NS	NS	NS	5.79
CALCULUS INDEX	$< \bar{0}.05$	NS	NS	NS	NS	0.43
PERIO INDEX	NS	NS	NS	NS	NS	0.75

B. Results from Rural Area

TABLE 20. SOCIAL CLASS AND DENTAL STATUS
Significant Differences found between Mean Scores in each social class and Mean of Total Sample.

SOCIAL CLASSES

	1 & 11	111, 1V & V	"p" VALUE
D.M.F.	11.35	10.95	NS
DECAYED TEETH	4.70	5.38	< 0.01
MISSING TEETH	1.61	1.90	< 0.05
FILLED TEETH	4.46	3.17	< 0.001
"DUNDEE" O.H.	5.11	5.68	< 0.001
CALCULUS INDEX	0.16	0.24	< 0.001
PERIO INDEX	0.57	0.63	NS

A. Results from Urban Area

	1 & 11	111, 1V & V	"p" VALUE
D.M.F.	12.29	11.37	NS
DECAYED TEETH	5.67	6.17	NS
MISSING TEETH	1.24	1.49	NS
FILLED TEETH	5.37	3.77	< 0.001
"DUNDEE" O.H.	5.86	5.76	NS
CALCULUS INDEX	0.42	0.43	NS
PERIO INDEX	0.75	0.75	NS

B. Results from Rural Area

TABLE 21. SOCIAL CLASS AND DENTAL STATUS
Comparison between children from non-manual and manual populations.

REGISTRAR-GENERAL'S SOCIAL CLASSIFICATION (1960)

	I	II	III	IV	V	TOTAL SAMPLE
NO TREATMENT	NO SIGNIFICANT DIFFERENCES					0.62%
O.H.I. ONLY						17.29%
CONS. & O.H.I. ONLY						50.62%
CONSERVATIVE						35.12%
PERIODONTAL						26.82%
EXTRACTIONS						29.77%
PART DENTURES						7.75%
FULL DENTURES						0.23%
ORTHODONTICS						51.71%

A. Results from Urban Area

	I	II	III	IV	V	TOTAL SAMPLE
NO TREATMENT	NS	$<0.01^{+}$	NS	NS	NS	2.18%
O.H.I. ONLY	NS	NS	NS	$<0.02^{+}$	NS	3.27%
CONS. & O.H.I. ONLY	NS	$<0.01^{+}$	$<0.001^{+}$	NS	NS	31.48%
CONSERVATIVE	NS	NS	$<0.001^{-}$	$<0.02^{+}$	NS	53.72%
PERIODONTAL	NS	NS	$<0.001^{-}$	$<0.01^{+}$	NS	45.19%
EXTRACTIONS	NS	NS	$<0.001^{+}$	$<0.05^{+}$	NS	23.23%
PART DENTURES	NS	$<0.001^{+}$	NS	NS	NS	4.90%
FULL DENTURES	NS	NS	NS	NS	NS	0.54%
ORTHODONTIC	NS	NS	$<0.001^{-}$	$<0.01^{+}$	$<0.05^{-}$	30.67%

B. Results from Rural Area

TABLE 22. SOCIAL CLASS AND TREATMENT NEEDS
Significant Differences found between percentage requiring a treatment in each social class and in the total sample.

SOCIAL CLASSES

	I & II	III, IV & V	"p" VALUE
NO TREATMENT	1.08	0.49	NS
O.H.I. ONLY	11.55	6.12	< 0.01
CONS. & O.H.I. ONLY	48.38	51.23	NS
CONSERVATIVE	34.30	35.34	NS
PERIODONTAL	24.91	27.34	< 0.001
EXTRACTIONS	21.66	31.98	< 0.001
PART DENTURES	5.78	8.29	NS
FULL DENTURES	0.36	0.20	NS
ORTHODONTICS	55.60	50.64	NS

A. Results from Urban Area

	I & II	III, IV & V	"p" VALUE
NO TREATMENT	4.58	1.43	< 0.05
O.H.I. ONLY	1.53	3.81	NS
CONS. & O.H.I. ONLY	39.69	35.48	NS
CONSERVATIVE	51.15	54.52	NS
PERIODONTAL	42.74	45.95	NS
EXTRACTIONS	19.85	24.29	NS
PART DENTURES	9.92	3.33	< 0.01
FULL DENTURES	0.76	0.48	NS
ORTHODONTICS	28.24	31.19	NS

B. Results from Rural Area

TABLE 23. SOCIAL CLASS AND TREATMENT NEEDS
Comparison between children from non-manual and manual populations.
(Figures in percentages)

	URBAN	RURAL
YES	85.62%	86.41%
NO	14.38%	13.59%

A. Responses to the question "Do you have a dentist?"

	URBAN	RURAL
YES	56.20%	52.07%
NO	43.80%	47.93%

B. Responses to the question "Do you attend your dentist regularly?"
(of those saying "yes" in Table A)

TABLE 24 DENTAL ATTENDANCE HABITS.

	URBAN	RURAL
YES	11.28	11.65
NO	9.24	10.30

A. Do you have a dentist?

	URBAN	RURAL
YES	11.53	12.45
NO	10.96	10.78

B. Do you attend regularly?

TABLE 25 DENTAL ATTENDANCE AND MEAN D.M.F.

	URBAN	RURAL
YES	5.16	4.75
NO	5.87	5.60

A. Do you have a dentist?

	URBAN	RURAL
YES	4.48	4.10
NO	6.03	5.46

B. Do you attend regularly?

TABLE 26 DENTAL ATTENDANCE AND MEAN NUMBER OF DECAYED TEETH.

	URBAN	RURAL
YES	5.50	5.71
NO	6.15	6.41

A.Do you have a dentist?

	URBAN	RURAL
YES	5.25	5.43
NO	5.82	5.94

B.Do you attend regularly?

TABLE 27 DENTAL ATTENDANCE AND MEAN "DUNDEE" ORAL HYGIENE INDEX.

	URBAN	RURAL
YES	0.36	0.44
NO	0.49	0.45

A.Do you have a dentist?

	URBAN	RURAL
YES	0.32	0.38
NO	0.40	0.50

B.Do you attend regularly?

TABLE 28 DENTAL ATTENDANCE AND MEAN CALCULUS INDEX.

	URBAN	RURAL
YES	0.63	0.75
NO	0.74	0.87

A.Do you have a dentist?

	URBAN	RURAL
YES	0.59	0.73
NO	0.69	0.77

B.Do you attend regularly?

TABLE 29 DENTAL ATTENDANCE AND MEAN PERIODONTAL INDEX.

	URBAN		RURAL	
Regular dental attenders?	YES	NO	YES	NO
No Treatment	0.67	0.68	2.78	2.26
O.H.I. only	10.77	5.52	3.47	1.89
Cons.and O.H.I.only	55.05	46.03	38.54	33.96
Conservative	32.30	35.34	49.31	59.62
Periodontal	21.40	28.97	40.28	50.19
Extractions	16.55	44.83	14.93	33.21
Part Dentures	6.33	10.34	5.21	7.17
Full Dentures	0.13	0.34	0	0.75
Orthodontics	49.53	58.79	31.25	34.72

TABLE 30 REGULAR DENTAL ATTENDANCE AND PERCENTAGE OF CHILDREN REQUIRING VARIOUS FORMS OF TREATMENT.

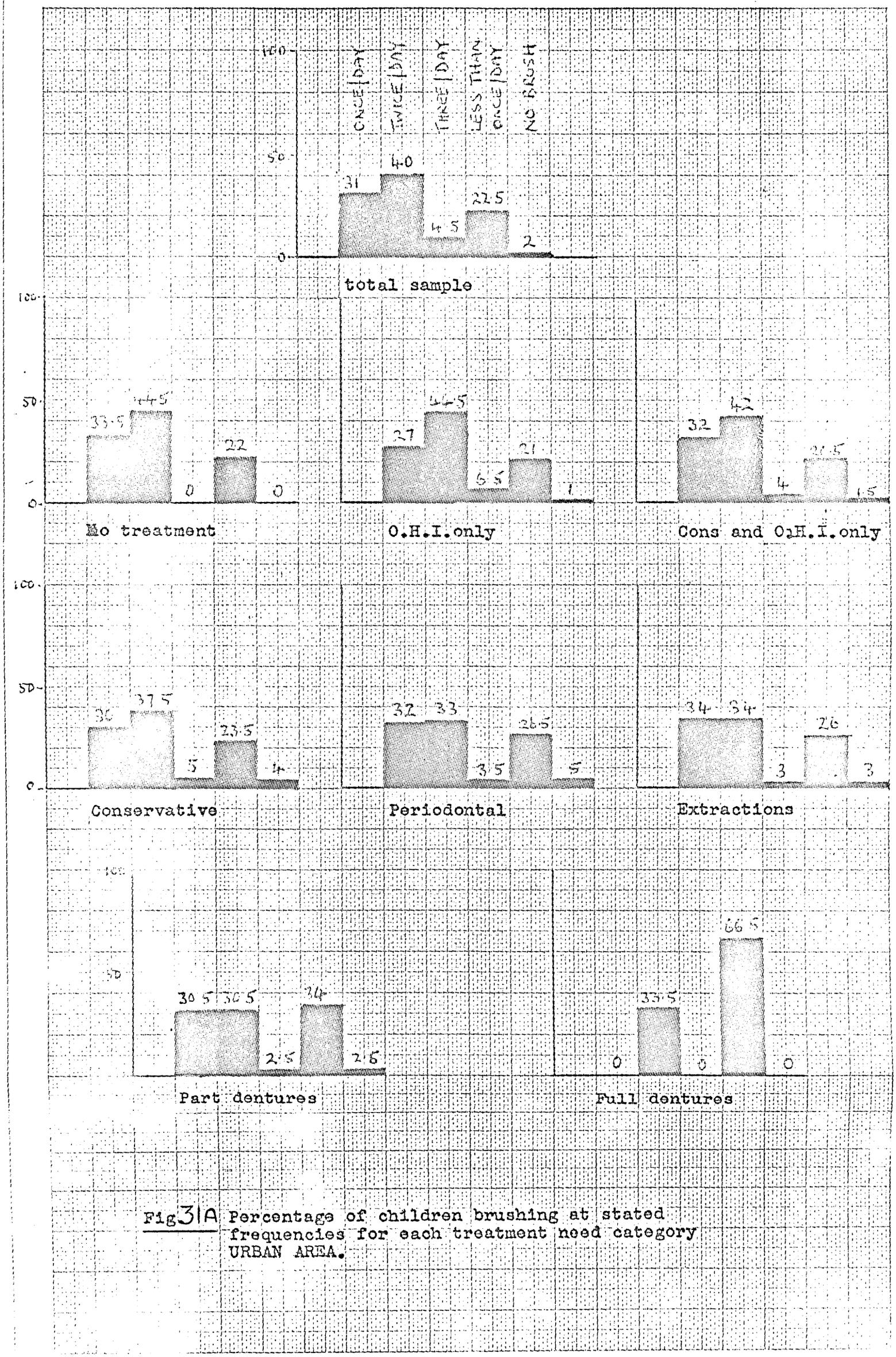

Fig 31A Percentage of children brushing at stated frequencies for each treatment need category URBAN AREA.

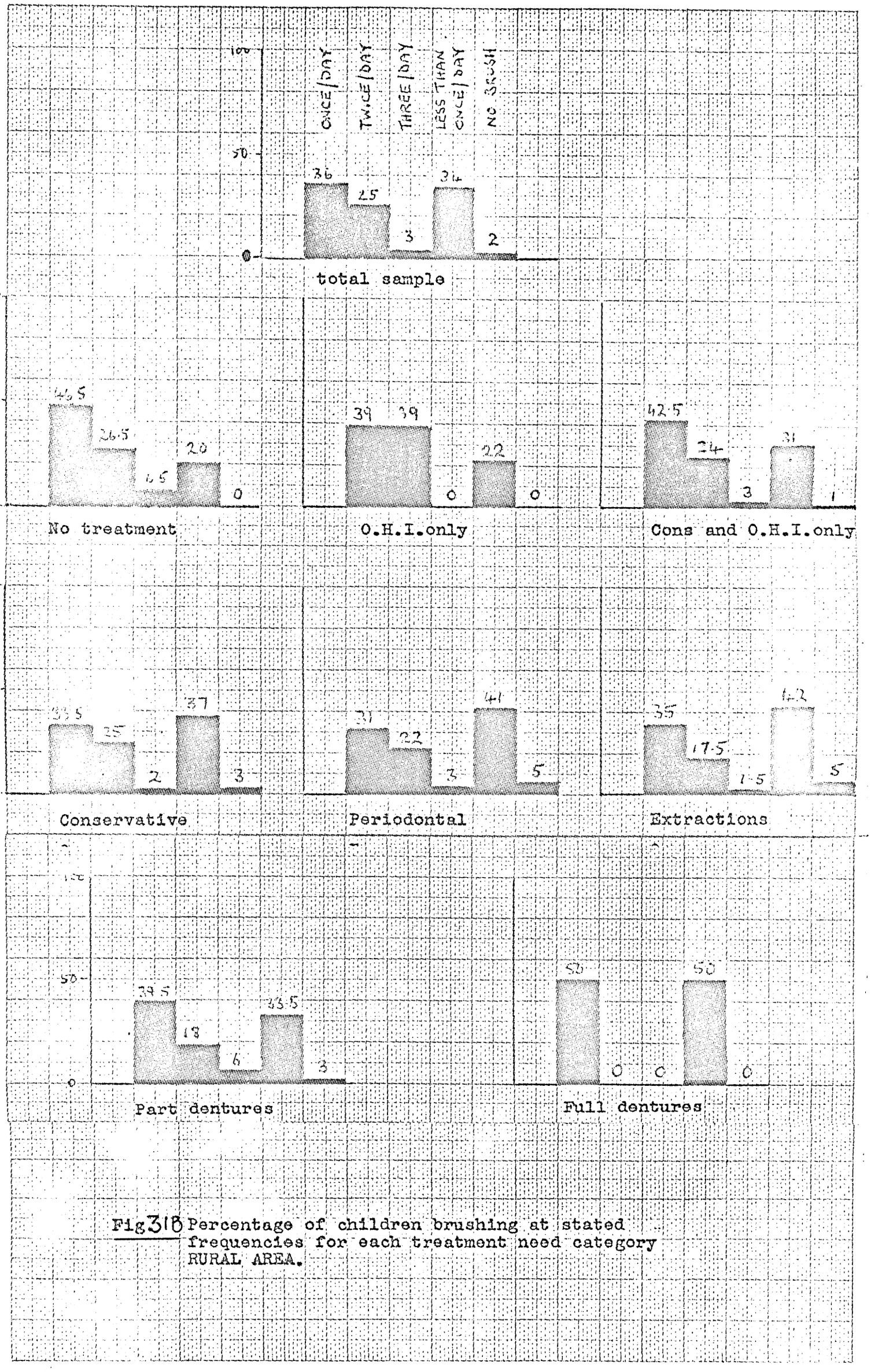

Fig 318 Percentage of children brushing at stated frequencies for each treatment need category RURAL AREA.

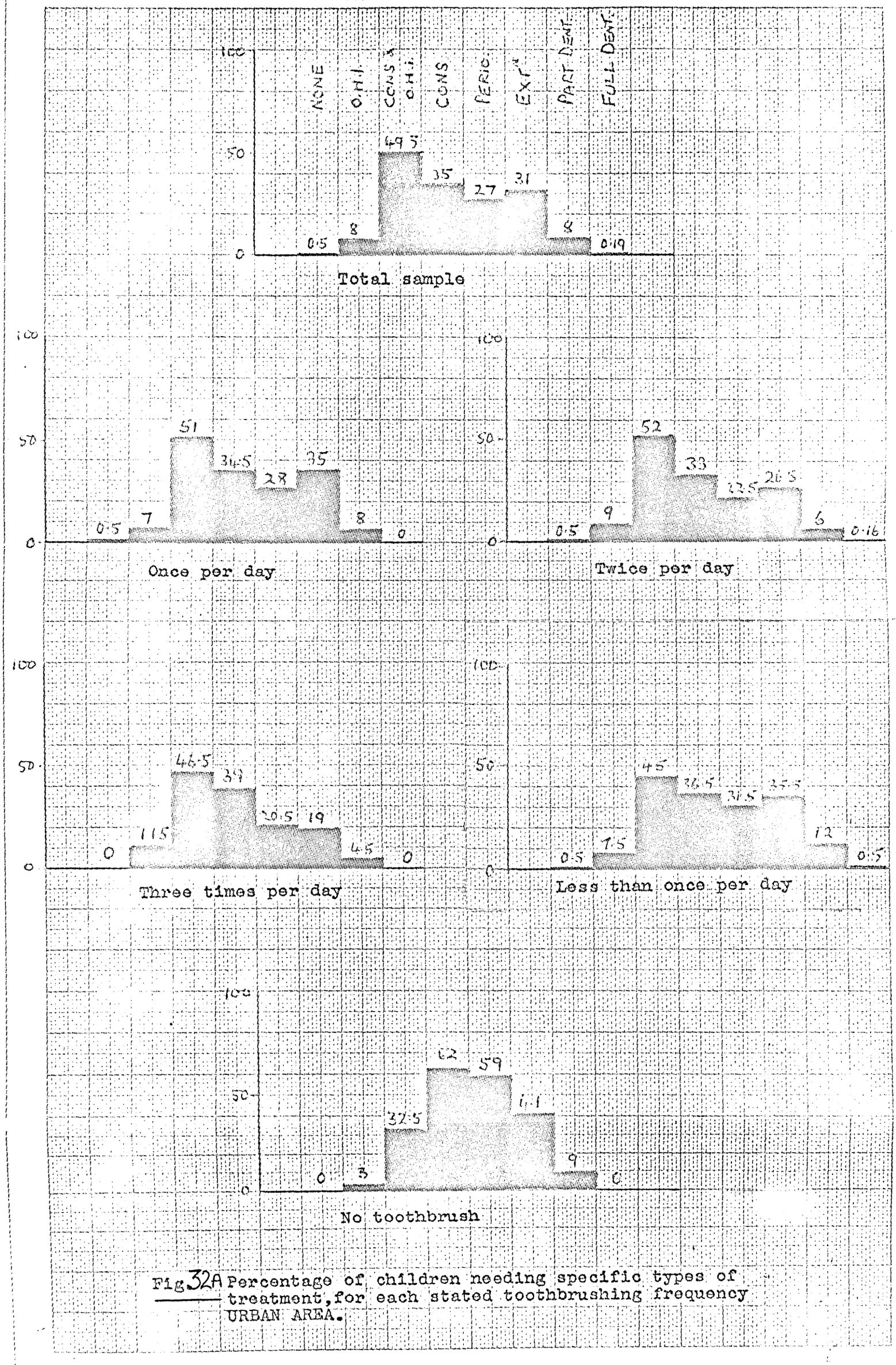

Fig. 32A Percentage of children needing specific types of treatment, for each stated toothbrushing frequency URBAN AREA.

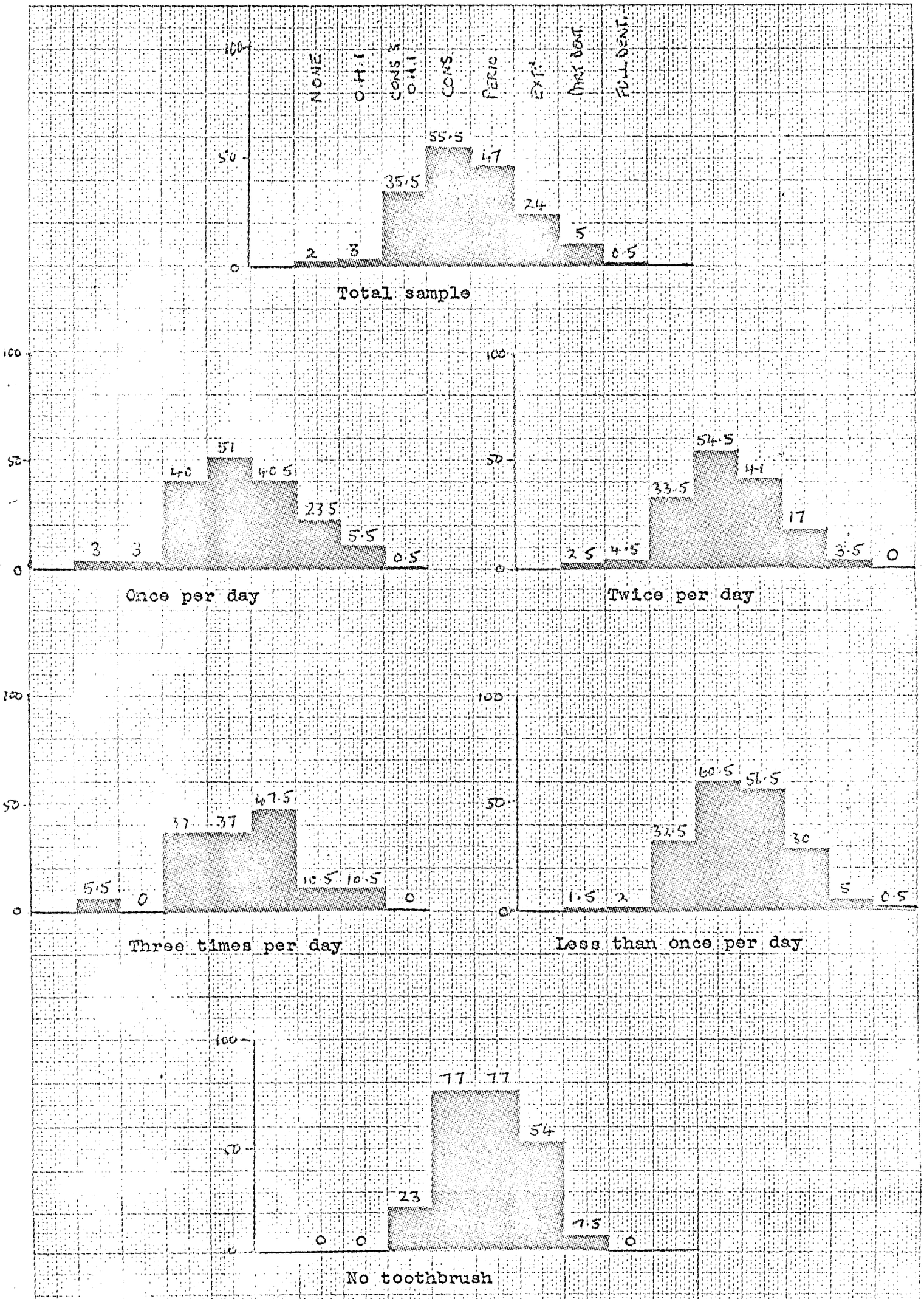

Fig.32B Percentage of children needing specific types of treatment, for each stated toothbrushing frequency RURAL AREA.

Treatment Needed

	YES	NO	"p"value
No treatment	1.00	1.63	<0.05
O.H.I. only	1.56	1.64	<0.01
Cons.& O.H.I. only	1.65	1.62	NS
Conservative	1.63	1.63	NS
Periodontal	1.64	1.63	NS
Extractions	1.75	1.61	< 0.05
Part Dentures	1.91	1.61	< 0.01
Full Dentures	2.00	1.63	<0.001

A) Results from URBAN AREA

Treatment Needed

	YES	NO	"p"value
No treatment	1.40	1.19	NS
O.H.I. only	1.22	1.20	NS
Cons.& O.H.I. only	1.16	1.22	NS
Conservative	1.23	1.16	NS
Periodontal	1.20	1.20	NS
Extractions	1.28	1.17	NS
Part Dentures	1.39	1.19	NS
Full Dentures	0.50	1.20	NS

B) Results from RURAL AREA

TABLE 33 TREATMENT NEEDS AND MEAN NUMBER OF SNACKS PER DAY.

Treatment Needed

	YES	NO	"p"value
No treatment	11.67	12.95	NS
O.H.I.only	10.96	13.12	<0.01
Cons.& O.H.I. only	13.12	12.78	NS
Conservative	12.93	12.95	NS
Periodontal	13.20	12.85	NS
Extractions	14.14	12.96	<0.05
Part Dentures	16.01	12.69	<0.001
Full Dentures	10.83	12.95	NS

A/) Results from URBAN AREA

Treatment Needed

	YES	NO	"p"value
No treatment	11.50	14.31	NS
O.H.I.only	13.33	14.44	NS
Cons.& O.H.I. only	14.14	14.30	NS
Conservative	14.82	13.55	<0.05
Periodontal	14.74	13.81	NS
Extractions	15.40	13.88	<0.05
Part Dentures	16.29	14.14	NS
Full Dentures	12.50	14.24	<0.001

B) Results from RURAL AREA

TABLE 34 TREATMENT NEEDS AND MEAN AMOUNT SPENT ON SWEETS PER WEEK (new pence)

	Treatment Needed		
	YES	NO	"p"value
No Treatment	6.59	9.99	NS
O.H.I.only	6.96	10.04	< 0.001
Cons.&O.H.I.only	10.12	9.80	NS
Conservative	10.11	9.87	NS
Periodontal	9.90	10.00	NS
Extractions	11.41	9.38	< 0.001
Part Dentures	14.06	9.66	<0.001
Full Dentures	18.00	9.94	NS
Orthodontics	10.18	9.87	NS

A) Results from URBAN AREA

	Treatment Needed		
	YES	NO	"p"value
No Treatment	7.47	11.56	< 0.001
O.H.I. only	8.83	11.54	< 0.001
Cons.&O.H.I.only	12.55	10.87	< 0.001
Conservative	11.34	11.62	NS
Periodontal	11.13	11.77	NS
Extractions	13.18	10.92	< 0.001
Part Dentures	16.12	11.21	< 0.001
Full Dentures	17.50	11.45	NS
Orthodontics	10.54	11.90	< 0.001

B) Results from RURAL AREA

TABLE 35 TREATMENT NEEDS AND MEAN D.M.F.INDEX VALUES.

	Treatment Needed		
	YES	NO	"p"value
No Treatment	3.56	5.61	< 0.001
O.H.I.only	5.12	5.62	< 0.01
Cons.&O.H.I.only	5.50	5.69	NS
Conservative	5.74	5.51	< 0.05
Periodontal	6.60	5.22	< 0.001
Extractions	6.81	5.77	< 0.001
Part Dentures	6.68	5.50	< 0.001
Full Dentures	6.33	5.59	NS
Orthodontics	5.33	5.90	< 0.001

A) Results from URBAN AREA

	Treatment Needed		
	YES	NO	"p"value
No Treatment	4.07	5.82	< 0.001
O.H.I. only	5.39	5.79	NS
Cons.&O.H.I.only	5.75	5.79	NS
Conservative	5.94	5.57	< 0.02
Periodontal	6.43	5.19	< 0.001
Extractions	6.77	5.46	< 0.001
Part Dentures	7.18	5.70	< 0.01
Full Dentures	4.00	5.78	NS
Orthodontics	5.71	5.93	NS

B) Results from RURAL AREA

TABLE 36 TREATMENT NEEDS AND MEAN "DUNDEE" ORAL HYGIENE INDEX.

	Treatment Needed		
	YES	NO	"p"value
No Treatment	0.00	0.38	< 0.001
O.H.I.only	0.00	0.39	< 0.001
Cons.&O.H.I.only	0.00	0.49	< 0.001
Conservative	0.50	0.31	< 0.001
Periodontal	0.50	0.00	< 0.001
Extractions	0.47	0.36	< 0.001
Part Dentures	0.42	0.37	NS
Full Dentures	0.42	0.38	NS
Orthodontics	0.37	0.38	NS

A) Results from URBAN AREA

	Treatment Needed		
	YES	NO	"p"value
No Treatment	0.00	0.44	< 0.001
O.H.I. only	0.00	0.44	< 0.001
Cons.&O.H.I.only	0.00	0.54	< 0.001
Conservative	0.55	0.23	< 0.001
Periodontal	0.64	0.00	< 0.001
Extractions	0.55	0.41	< 0.001
Part Dentures	0.43	0.44	NS
Full Dentures	0.25	0.44	< 0.001
Orthodontics	0.47	0.43	NS

B) Results from RURAL AREA

TABLE 37 TREATMENT NEEDS AND MEAN CALCULUS INDEX.

	Treatment Needed		
	YES	NO	"p"value
No Treatment	0.14	0.68	< 0.001
O.H.I.only	0.86	0.63	< 0.001
Cons.&O.H.I.only	0.60	0.69	< 0.001
Conservative	0.64	0.66	NS
Periodontal	0.73	0.61	< 0.001
Extractions	0.76	0.51	< 0.001
Part Dentures	0.94	0.62	< 0.001
Full Dentures	1.08	0.65	NS
Orthodontics	0.73	0.56	< 0.001

A) Results from URBAN AREA

	Treatment Needed		
	YES	NO	"p"value
No Treatment	0.28	0.77	< 0.001
O.H.I. only	0.76	1.47	< 0.001
Cons.&O.H.I.only	0.76	0.77	NS
Conservative	1.02	0.73	< 0.001
Periodontal	0.90	0.64	< 0.001
Extractions	0.94	0.71	< 0.001
Part Dentures	0.98	0.75	NS
Full Dentures	1.75	0.79	NS
Orthodontics	0.47	0.43	< 0.01

B) Results from RURAL AREA

TABLE 38 TREATMENT NEEDS AND MEAN PERIODONTAL INDEX.