Total tooth loss in the United Kingdom in 1998 and implications for the future

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The 1998 Adult Dental Health Survey, published this year, showed that the number of people without teeth should fall over the next three decades, to only 4% of the UK population. Patterns of tooth loss and retention are also changing. This article, the first of a series on the interpretation of the Adult Dental Health Survey, discusses the implications of these trends for dentistry.

At the time of the first national survey of adult dental health, which was held in 1968 and covered only England and Wales, over one third of the population (37%) had no natural teeth. Even amongst people aged 35–44 at that time, an edentulous mouth was a common finding (22%).[1] Times have changed. This paper will use data from the most recent United Kingdom Adult Dental Health Survey,[2] to describe the oral health of the nation in 1998. The data were also used to predict what is likely to happen over the next 20 or 30 years and these projections and their implications for the profession will be discussed.

For the purposes of this article, oral health is measured in very simple terms; the proportions of the population who have some natural teeth, the mean number of teeth they have and the proportions who have a 'functional' natural dentition. Although it is a crude measure of oral health, the proportion who have no natural teeth is both clear cut and important. However, as fewer people lose all of their teeth, its usefulness reduces, and other measures (such as the number of teeth and the proportion with a 'functional' natural dentition) may be necessary if an accurate indication of oral health is to be obtained from all patient groups. Data relating to these are also reported here in order to illustrate and discuss some of the important implications for dental practice from the findings of the survey.

The national surveys of Adult Dental Health have given a 10-yearly summary of the clinical condition of adults in the United Kingdom (England and Wales only in 1968, Scotland and Northern Ireland were surveyed later) on three previous occasions.[1–7] The fourth report in the series was published in March of 2000. For the 1998 survey 4,984 addresses were identified at which all resident adults aged over 16 years were asked to take part in the survey; 21% of households refused and no contact was made at 5%. In total, 6,204 adults were interviewed following which those with some teeth were asked to undergo a dental examination; 3,817 (72%) of those eligible agreed. A weighting system based on some of the interview responses of those who consented to be dentally examined and those who were interviewed but not dentally examined was used to reduce bias from non-response. The survey was carried out under the auspices of the Office of National Statistics together with the Universities of Birmingham, Dundee, Newcastle-upon-Tyne and Wales.

In brief
- In 1998, 87% of all adults had natural teeth
- By 2028 it should be about 96%
- A small but varied group of people will continue to become edentulous
- The replacement of missing teeth in partial dentitions will continue to be very common for the foreseeable future

Who had no natural teeth at all in 1998?

The irreversible nature of the two main destructive dental diseases (caries and periodontal disease) dictate that age is always likely to be a principal factor associated with total tooth loss. Figure 1 shows the proportion who do and do not have teeth, plotted against age. Although 87% of all adults had some natural teeth, up to the age of 45 the figure was almost 100%, while over the age of 54 being edentate was still a relatively common occurrence. Amongst people aged 75 and over, those without natural teeth were still in the majority (58%). Nevertheless, the retention of some natural teeth is now sufficiently common that, amongst the 'younger-old' population nearly two thirds (64%) of the 65–74 year age group and more than half of all of the people of 'pensionable' age in the UK (54%) now have at least a few natural teeth. Over the age of 44 though, the age related difference in the proportion of the population without any teeth was quite marked. Perhaps it is of relevance that the population below this age in 1998 had had an entire lifetime of the National Health Service (assuming they have been residents throughout), but that this was not the case for those aged 50 or over in 1998 (Fig. 1).

Social class, in combination with gender, was also associated with having no teeth. Social class differences in total tooth loss were much greater among men than women and this was particularly noticeable amongst older men in comparison with older women (Fig. 2). It is difficult to be sure why older men from non-manual backgrounds were more likely to have teeth than those from manual working backgrounds, while women did not appear to show the same social class difference. When multivariate analyses were undertaken to control for the effects of confounding variables such as age, marital status and various others, the association with gender disappeared. The

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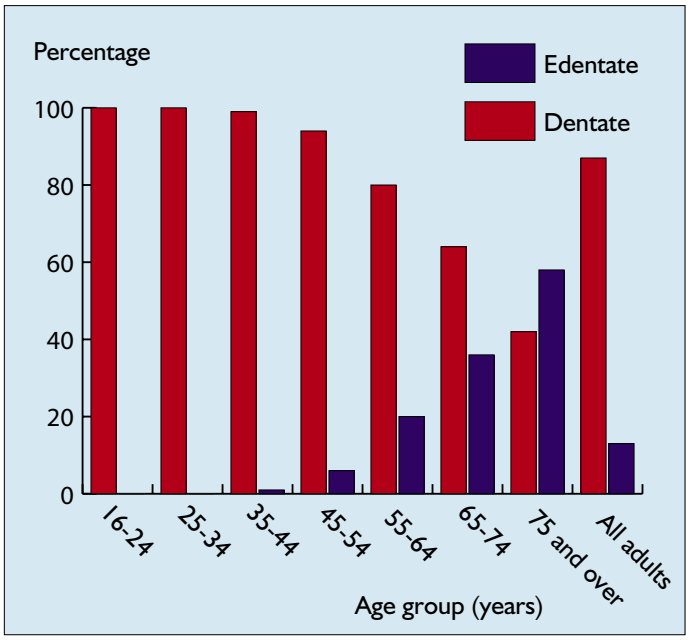

Fig. 1 Dental status by age in the United Kingdom in 1998

differences observed according to gender may be accounted for by other factors, such as marital status. The role of social class (which was still significant in the multivariate analysis) perhaps suggests that differences arise from social values associated with appearance, and the contribution, or otherwise, made to appearance by natural teeth in older people (Fig. 2).

Are there still regional differences in total tooth loss?

The first Adult Dental Health survey in 1968 showed the profound differences in various measures of oral health between the North and South of England.[1] Subsequent surveys undertaken in 1972 and 1979 clearly showed that this extended to Scotland and Northern Ireland as well.[5,6] The 1998 survey has found these differences persist in many instances (Fig. 3). The area with the highest proportion of the population with some natural teeth was the South of England where 90% of the population (93% of men and 88% of women) was dentate. The rest of the country lagged some way behind with the lowest proportion of adults with some natural teeth being in Scotland (83%).

There are differences in the social class structure of the regions and countries of the United Kingdom that potentially could account for the differences between them. However, the differences persist to some extent, even between similar social class groups in different parts of the United Kingdom, suggesting that there has been a cultural dimension to the pattern of total tooth loss around the country. Taking all of the factors together produces quite profound differences; women from an unskilled manual background living in Scotland (amongst whom 36% were edentate), were 12 times more likely to have no teeth at all, than men from a non-manual background in the south of England (3% edentate). Generally speaking, women from unskilled working backgrounds were the population group with the lowest proportion of people with some natural teeth.

In terms of the geographical variation it is really the South of England which is at variance from most of the rest of the country. Overall, 90% of people in the South of England were dentate, but the proportions in the other areas were relatively similar (83–86%), with only Northern Ireland approaching the South of England in terms of the proportion with teeth (88%). Despite these differences within the United Kingdom, many of the cases where there are no natural teeth actually reflect what happened many years ago. All areas of the country are seeing a similar rapid reduction in the prevalence of edentulousness, but in crude

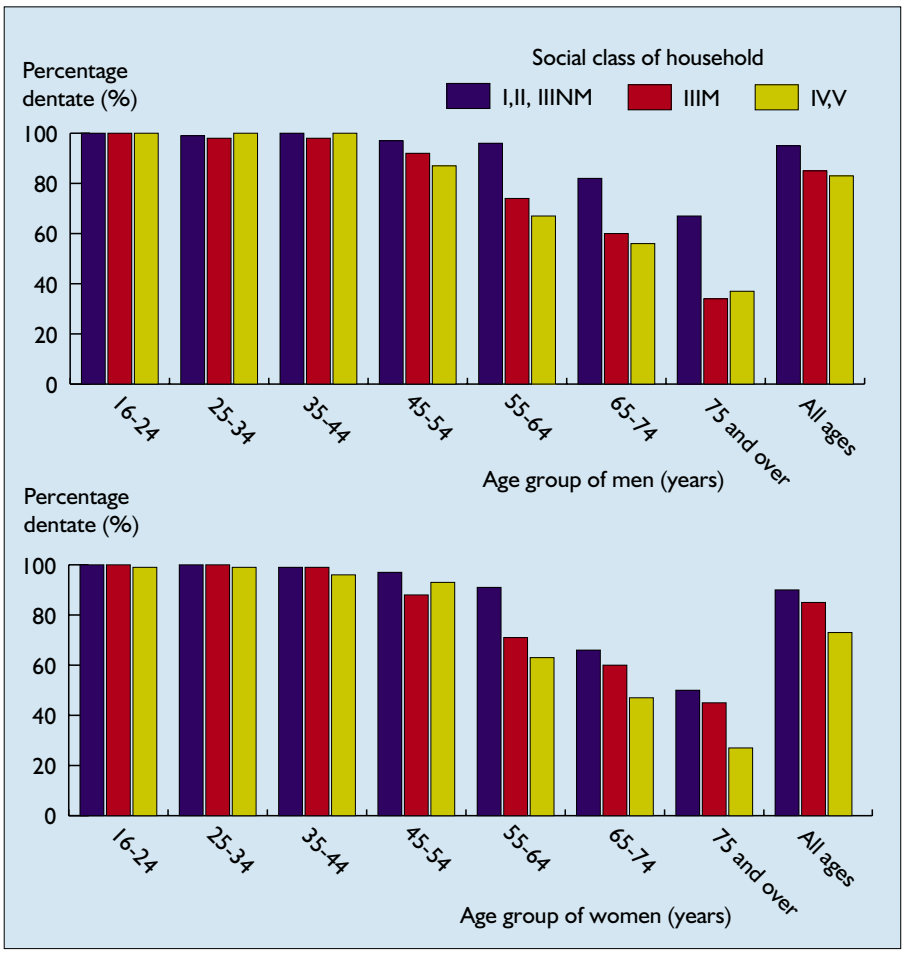

Fig. 2 Data: percentage dentate by age and social class of head of household as defined by occupation in the United Kingdom in 1998. Data for men and women are presented separately.

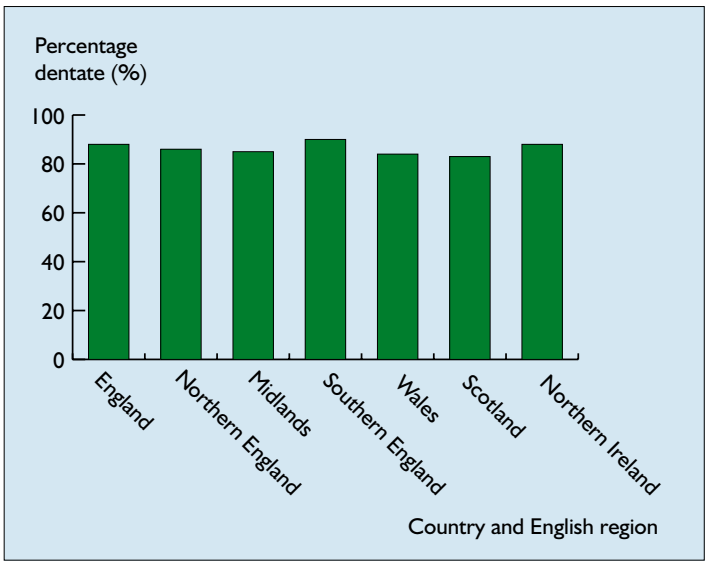

Fig. 3 Percentage dentate by home country and English regions

terms the rest of country reached the point in 1998 which the South of England had already reached at the last survey in 1988, so the South of England is further forward in the process. The patterns we see now therefore may not reflect the current pattern in the incidence (new cases) of total tooth loss. This leads us on to the next question, which relates to these new cases of total tooth loss.

Who became edentate in the 1990s?

Although the overall prevalence of total tooth loss has fallen sharply over recent decades, there are still people who are becoming edentulous. These people are important because, although their numbers are small, they are potentially quite difficult to manage clinically.

Only 96 people out of over 6,000 who were interviewed had lost all of their teeth in the 10 years preceding the survey.[1] This represents between 1% and 2% of the sample. All age categories were represented, including one 18-year-old. Twenty-six people aged less than 55 in 1998 had lost all of their teeth sometime in the preceding 10 years, but most were aged 55 years or over at the time of the survey. In contrast to the historical distribution of edentulousness, the social and geographical distribution of these people was rather even, with no social groups or parts of the country being obviously more affected than others. With so few people involved it would have been difficult to identify subtle trends with confidence, but no obvious differences emerged.

How and why did they lose their teeth?

The pattern of loss of the last teeth has changed markedly. People who became edentulous in the period tended to have fewer teeth removed at their final clearance than has been the case in the past. In 1968 two-thirds of people who had lost all of their teeth had had 12 or more teeth removed at their final clearance, 10 years later this had dropped to one-half, by 1998 it was only one-quarter. The fact that fewer teeth are now being removed at final clearance probably reflects a combination of factors, such as a reduction in the number of people who have devastating amounts of oral disease and perhaps also a greater determination among patients and their dentists to retain some natural teeth for as long as possible.

Those who lost their teeth in the preceding 10 years were asked what they thought the reason for loss of their last remaining teeth was and what problems they had prior to losing them (Fig. 4). Decayed teeth was the most frequently cited cause for final clearance (in 64% of cases) and 28% said it was caused by bad gums. However, when asked what problems they had experienced just prior to having all their teeth taken out, over a half mentioned having had some gum problems or loose teeth. Less than one in ten people said they had no real dental problems prior to the loss of the last of their teeth.

What do we expect the level of total tooth loss to be in future?

According to the projections, which used the same methods as were used successfully for the 1988 survey, it is unlikely that we will reach a stage where edentulousness disappears completely from the population. The trend has been evident now since the first survey in England and Wales in 1968, and can be seen clearly in Figure 5. Projections using data from 1988 and 1998 show that

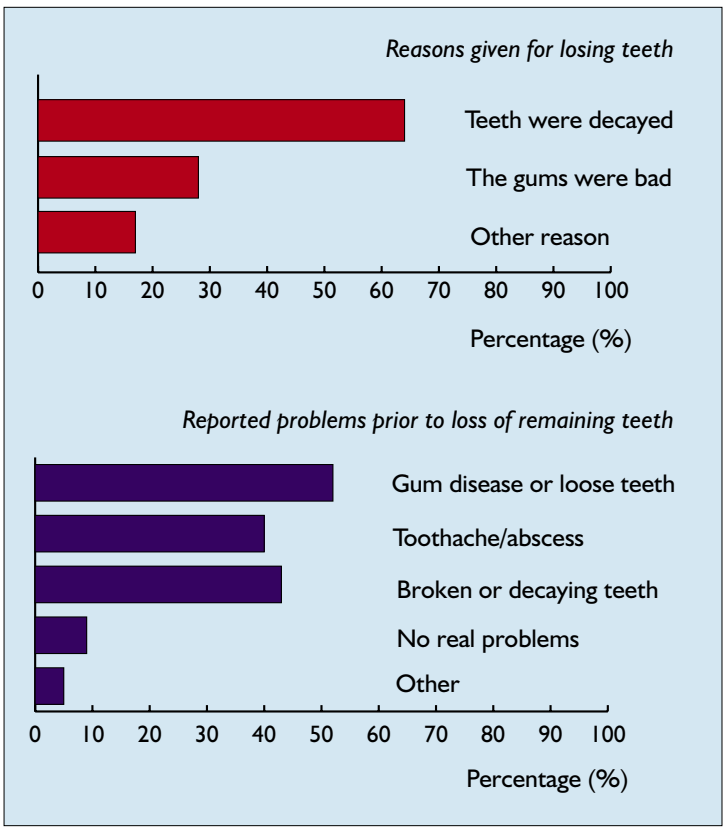

Fig. 4 Reasons for losing the last remaining teeth and reported problems prior to loss among people who had become edentulous in the previous 10 years

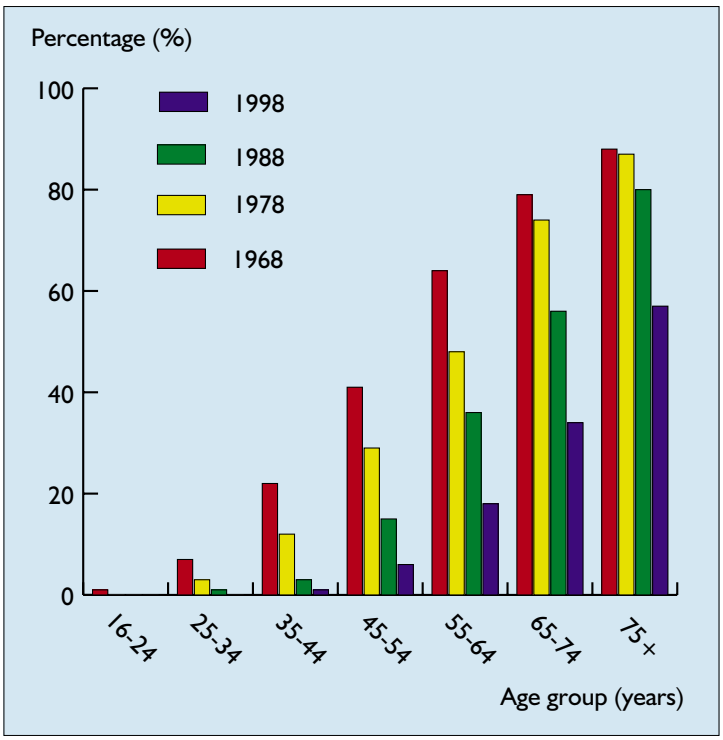

Fig. 5 Trends in the percentage of adults without natural teeth, 1968-1998, the UK trends are very similar

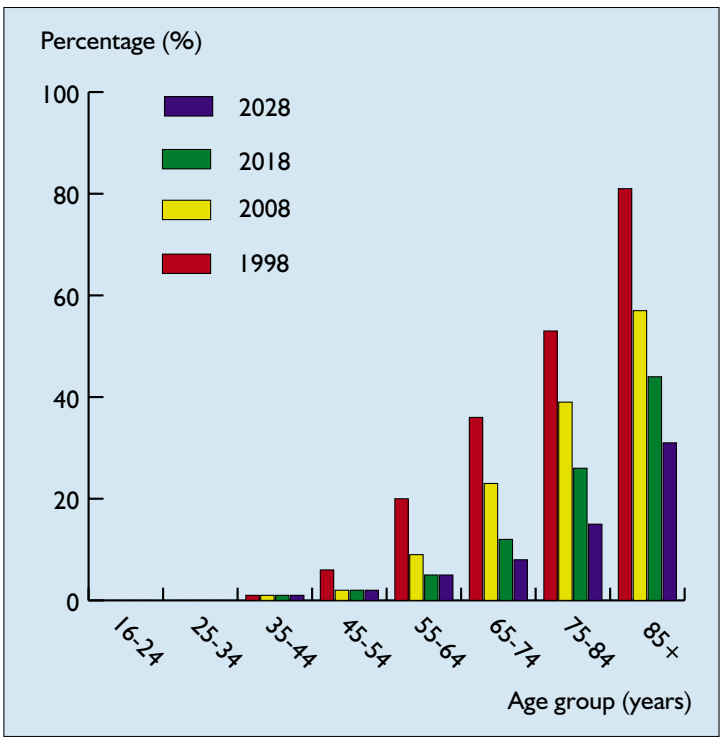

Fig. 6 Projections of future trends in the percentage of UK adults without natural teeth, 1998-2028

the proportion of people with no teeth at all is expected to drop to 8% in 2008 and to 5% by 2018 (Fig. 6). It does not show any sign of disappearing completely because a small number of new cases continue to arise, and this incidence was only slightly lower in the last decade than it was in the previous one. Although these people will mostly be old, (over the age of 75 years) the data on recent cases of total tooth loss suggest that there will still be a reasonable proportion of them in late middle age, perhaps particularly those who suffer from advanced periodontal disease (half of them reported gum disease or loose teeth prior to losing the last of their teeth). If the recent pattern of new cases continues they will be more evenly distributed on the social and geographical spectrum than the current prevalence data suggest (Figs 5 and 6).

Do the people who have teeth have more of them than they used to?

Retaining natural teeth is all very well, but is only likely to be a major benefit if enough of them are retained to allow better function than would be the case without them.

In fact, the number of teeth which people have has also increased over recent years. The average number of teeth (amongst people with teeth) was 24.8, but this was obviously highest among the younger groups, reducing quite sharply among the oldest. This compares with 23.1 teeth among dentate people 20 years ago. Bearing in mind that the proportion of people with teeth has increased substantially in that time, the real increase in the total number of teeth in the country will have been much greater (Fig. 7).

The number of teeth varied to some extent according to gender, social class and geography, but the factor which appeared to make the biggest impact was whether or not people said that they went to the dentist for regular check-ups. The difference between 'check-up' attenders and people who said they only attended when they had trouble was small in the younger age groups. However as age increased, and the cumulative effects of untreated disease were felt, a considerable gulf opened up. Among 55–64 year olds the difference between the two groups was an average of six teeth. In terms of tooth retention, dental attendance does appear to be of substantial benefit over the course of a lifetime (Fig. 8).

Just as the retention of some teeth is increasing, so is the retention of a 'functional dentition'. The proportion of people with 21 or more teeth is used as a way of recording a 'functional dentition'. Although the figure is essentially arbitrary, the relevance of the 21 tooth threshold is backed up by evidence relating to diet and comfort.[8–11] Altering the figure to '22 or more' or '20 or more' teeth would make relatively little difference, but it is around this point or above that people tend to experience dietary freedom and be able to rely on natural teeth without dentures for comfortable function. In this survey it represented a sharp cut-off point for partial denture wearing (Fig. 9).

Over 72% of all adults had 21 or more natural teeth in 1998, but the figures amongst older adults are much lower; only 10% of all people aged 75 or over had 21 or more teeth. Projecting forwards from these

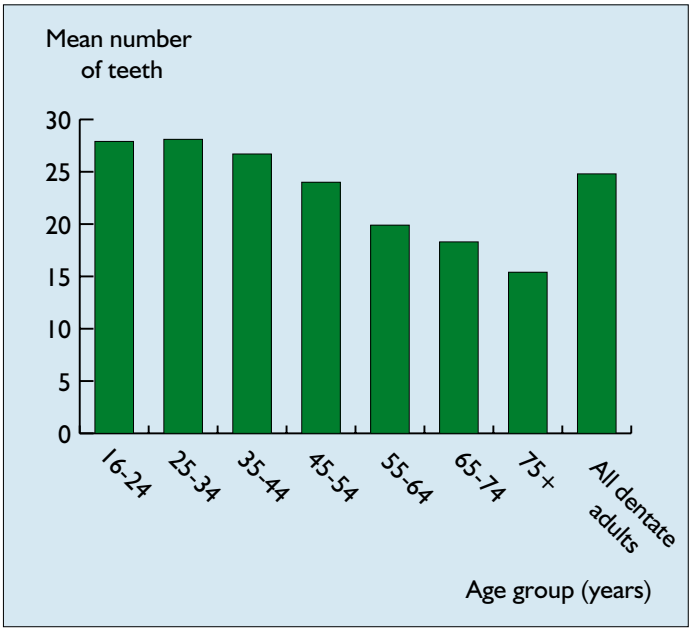

Fig. 7 Mean number of teeth by age

data, around 90% of 16–74 year olds should have a natural dentition of 21 or more teeth by 2018, but the figure will be lower for older people. The trend is certainly towards retaining a functional dentition into old age, although perhaps not for an entire lifetime. It will be a very long time indeed though before the proportion of the population with 21 or more teeth approaches 100%. A combination of natural teeth and dentures will still be as common as ever for the next couple of decades at least, and the management of this situation, particularly amongst older adults, will be a very important issue for dentists for many years to come. This brings us on to the next question.

What does the declining incidence of edentulousness and the increase in the number of people with a functional natural dentition imply for the profession in the future?

It is easy to assume that, with the proportion of United Kingdom adults who are edentate decreasing to around only 5% over the next 20 years, the need for skills in complete denture prosthodontics will diminish. The reality is likely to be somewhat more complex. The predicted 5% of the adult population in 2018 may not sound like a lot, but it still accounts for a couple of million adults, and a similar number of sets of complete dentures in circulation. In the past, undergraduate students developed skills in prosthodontics which they had ample opportunity to refine and consolidate in dental practice. Nowadays, with perhaps four or five million edentate adults, many dental schools are already finding it difficult to identify appropriate undergraduate teaching material. In future, teaching hospitals are likely to find cases even more difficult to come by and many dentists in practice are likely to see too few cases to maintain their skills and confidence, let alone to develop them.

The increasing complexity of many such cases, and perhaps also the increasing reluctance of our patients to become one of the small proportion of edentate people (data from the survey also supports this attitudinal trend), may make a large number of cases very challenging to manage. One likely outcome is that many dentists may feel uncomfortable about treating such patients and their management may be transferred to the minority of dentists who have specific expertise or training in this area of dental care. We may also expect the use of implant technology to continue to develop.

For their part, many undergraduate schools have already changed their training strategy, but further alterations may need to be made in this important area of dentistry in order to deal with this evolving situation. For dentists who have finished their undergraduate training and are starting out in their careers, skills in complete denture prosthodontics may turn out to be more useful than it may seem from the bald statistics presented in the report, but only for those who are prepared to develop them to a high level.

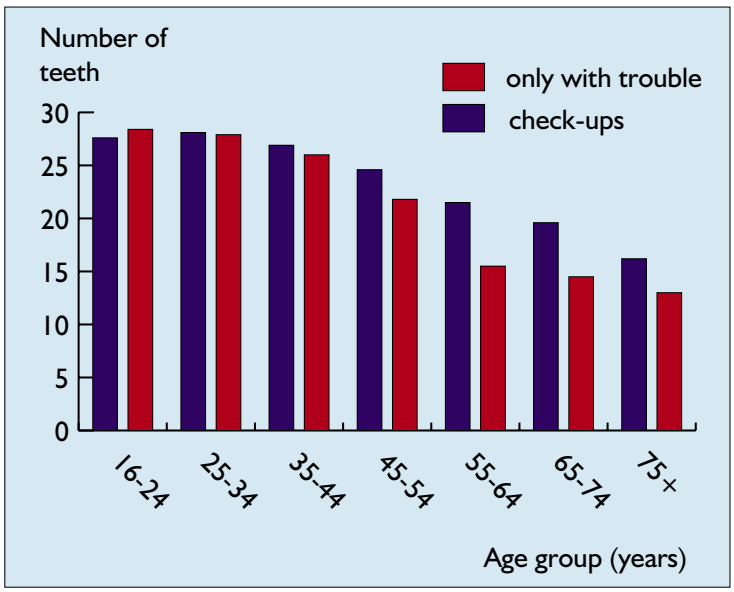

Fig. 8 Differences in the number of teeth by age according to reported attendance status

These data are also of enormous relevance to the current debate about the training of 'denturists'. Whilst we have no wish to enter this particular argument here, whether you support or reject the potential introduction of trained denturists, there is no doubt that this changing environment, including the potential alterations in undergraduate and postgraduate training and in referral patterns, ought to be major considerations.

There have been clear improvements in the proportion of the population achieving the '21 or more teeth' threshold, but it will be a long time before a majority of older people will be able to function without the need for some sort of prosthesis to fill the gaps left by lost teeth. Appropriate management of older dentate people will continue to involve managing depleted dentitions with the various prosthodontic, restorative and preventive skills that this entails. Indeed, given the slowing of the pace of the transition to total tooth loss and the apparent increase in demands for tooth preservation, these skills are likely to see plenty of scope for improvement.

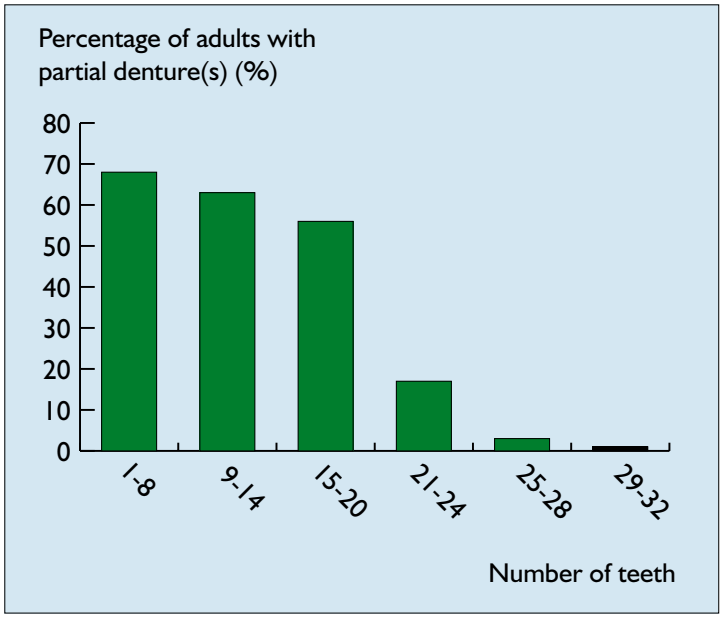

Fig. 9 Percentage of adults wearing a partial denture according to the number of teeth

Are there any management issues for the individual patient?

Even if many practitioners choose to refer their complete denture patients for the construction of dentures, dental disease in the earlier stages of the pathway to total tooth loss will still need to be managed by the general dentist. The new cases could arise anywhere in the country, and although the overall incidence will be very low, complete tooth loss may affect anybody. However, the risk of losing all teeth should be obvious some time before the last teeth are removed. People taking part in the survey in 1998 were asked how upset they were at losing the last of their teeth. The resulting data suggest that people who lose the last of their teeth in years to come may be rather reluctant to do so. People who expected to lose their teeth were significantly less likely to be upset about the process than those for whom it was a surprise. If the candidates for total tooth loss can be identified early, good communication and sensible long-term planning may save a great deal of heartache later on.

How quickly will these changes occur?

It will take time for the oldest cohort of people, who have been edentate for many years, to be lost completely from the population, and all of the other trends are gradual. They will however be very apparent within just a part of a practising lifetime.

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