A Critical Assessment of High-earning Orthodontists in the General Dental Services of England and Wales (1990–1991)

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Abstract. *Cases from the Dental Practice Board's 2 per cent random sample of completed cases which had been treated by orthodontic practitioners with high gross earnings, were compared to all the cases within the sample from other practition - ers. They were assessed using the PAR index and IOTN.*

High earning orthodontists treated slightly more cases with lower objective need for treatment, but treated no more cases 'Unnecessarily' than other practitioners. They used more fixed appliances, and had marginally better levels of residual need for treatment at finish, although this was at least partially explained by lower levels at start. Generally, their standards were not substantially different to other practitioners.

Appliance type had a marked effect on outcome, as did levels of malocclusion and need for treatment at start. Both groups of practitioners performed similarly (better) with dual arch fixed appliances: however, overall standards could only be described as mediocre.

There is no justification to single out high earning orthodontists for special scrutiny. However, it may be beneficial if the system of remuneration in the General Dental Services could be modified to give more positive incentive to quality, rather than simply quantity of treatments.

Index words: Caseload; GDS Orthodontics; High-earning Orthodontists; Payment of practitioners; Standards.

At the inception of the National Health Service General Dental Services (GDS) the Spens Committee (1948) anticipated that the 'fee per item service' system of payment may have a tendency to encourage quantity at the expense of quality of outcome and suggested financial incentives to counteract such an effect. Since then, 'fee per item' has been criticised on several occasions, perhaps most eloquently by 'The Tattersall Report' (GDSC, 1964) which described the treadmill of 'more work, less pay' that the system induced. Furthermore, the average orthodontic caseload in the GDS in England and Wales was reported by Shaw (1983) to be substantially higher than in countries generally considered to have better orthodontic standards. He suggested that an element of over-prescription was inherent to the 'fee per item' system of payment, and that orthodontic standards in the U.K. could be improved by encouraging smaller caseloads.

In the mid-1980s, the media focused the public's attention on the very high incomes apparently enjoyed by some orthodontic operators in the GDS, and concern was raised that some patients were receiving poor and/or unnecessary orthodontic treatment. The findings of the subsequent 'Schanschieff Report' (DHSS, 1986) reinforced these concerns, also suggesting that very high caseloads and incomes may be linked to poor or unnecessary treatment.

In the aftermath of the Schanschieff Report and subsequent evaluation within the profession, the Peer Assessment Rating (PAR) Index was devised, and the Index of Orthodontic Treatment Need (IOTN) refined and developed, at the University of Manchester. The indices and their development have been well described elsewhere (Evans and Shaw, 1987; Brook and Shaw, 1989; Richmond *et al.*, 1992a,b, 1993, 1994), so only brief mention will be made here. IOTN (see Table 1) assesses the need for orthodontic treatment according to the highest potential risk to the integrity of the teeth or their supporting

TABLE 1 *Summary of IOTN—categories of need for treatment*

Category of need	DHC grades	AC grades
No/Little need	1 and 2	1–4
Borderline	3	5–7
Clear/Great need	4 and 5	8–10

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structures from the malocclusion (Dental Health Component, (DHC), and/or the aesthetic impairment present (the Aesthetic Component or AC). The PAR Index gives a single summary score, representing the degree of dento-alveolar irregularity, or malocclusion present; data from before and after treatments for the caseload of a practitioner or service give a measure of the effectiveness of that service, which is assessed most frequently as the mean percentage reduction in PAR score. In addition, categories of improvement (Greatly Improved, Improved or Unimproved) are defined by a mathematical formula or nomogram, both of which were defined by Discriminant Analysis from the collective opinion of a panel of 74 practitioners.

The concerns raised by the Schanschieff Report regarding high-earning orthodontists have still not been fully investigated, and it would seem appropriate to assess the veracity of any suggestion that these practitioners are 'over-prescribing and under-treating', and that was the aim of this study.

Methods

Records of 1527 cases were collected for the study by the Dental Practice Board (DPB) of England and Wales, using their routine systematic sampling technique: records were requested for every 50th completed case presenting for payment. These included 474 cases from 'High Earners', defined by the DPB as the 20 practitioners with the highest gross earnings from orthodontics nationally, although clearly practice overheads, and so nett income would vary somewhat within this group. The remainder were from 'Other Practitioners', that is any practitioner not included in that category. Ninety-eight per cent of the cases were completed between June 1990 and September 1991.

A limited amount of information about the patient and practitioner (including whether or not the latter possessed a post-graduate diploma in orthodontics) in each case was available on the FP17 (0) forms which accompanied the casts (names and addresses had been obliterated to respect confidentiality). The cases were scored using the PAR Index and IOTN by one of the authors, who is calibrated in use of these indices. The data was organised and analysed using SPSS for Windows (1993) to assess entry and exit levels of need for treatment and level of malocclusion of the two categories of practitioner.

Statistical methods

Chi-squared tests were used to compare categorical data (*e.g.* numbers of cases treated with removable appliances), and Mann–Whitney tests were used to compare central tendency of ordinal data (*i.e.* AC and DHC grades). Analysis Of Variance was used to assess factors affecting PAR score at start of treatment, and General Factorial ANOVA was used to assess effects on the outcome measures of PAR at finish, and reduction and percentage reduction in PAR. Suitable models were found for PAR at start and reduction in PAR without any mathematical adjustment, and PAR at start was used as the covariate in the analysis of reduction in PAR. Weighted PAR at finish was assessed as its logarithm (base 10), and percentage reduction in PAR as the logarithm of the proportion of PAR at finish to PAR at start, and $\log_{10}$ PAR at start was used as the covariate for both of these. The factors submitted to analysis for starting PAR score were: orthodontic qualification (or not) of the practitioner, and caseload (High Earner or Other Practitioner). In addition, the covariate (starting PAR or its logarithm) and starting DHC grade (5, 4 or $\leqslant 3$) and AC category of need (grades 8–10, 5–7, and 1–4) were fitted to the models for data after treatment. Factors were inserted and removed experimentally to find the model in each case with the strongest value for R^2, and which left the least amount of variance unexplained.

Results

Postgraduate Orthodontic Diplomas

Three-hundred-and-seventy (78·1 per cent) of the 'High Earners' patients had been treated by practitioners with a Diploma or Membership in orthodontics, compared to 408 (38·5 per cent) of the Other Practitioners' ($P < 0{\cdot}00005$).

Treatment Differences

Appliance types used (see Fig. 1). High Earners used fewer 'removable appliance only' regimes (39·2 per cent) than Other Practitioners (54·1 per cent $P < 0{\cdot}0001$); they also used slightly more dual arch fixed (27·6 per cent cf 22·8 per cent; $P < 0{\cdot}05$).

Time in treatment. Mean time in treatment was 1·31 years for both High Earning Orthodontists and Other Practitioners.

Need for Treatment at Start and Finish

IOTN—central tendency of grades (Table 2). Small, but statistically significant differences in grades were found as follows.

Start of treatment: High Earners' cases had slightly lower IOTN grades at start than other practitioners ($P < 0{\cdot}05$ for AC, $P < 0{\cdot}01$ for DHC). The differences in AC grade represented a difference in treatment of cases with No/Little aesthetic need (AC grades 1–4) of 6·3 per cent for the High Earners compared to 1.3 per cent for Other Practitioners ($P < 0{\cdot}00005$). The difference in DHC grade was associated with differences in levels of cases with Clear need (DHC grades 4 and 5); 76 per cent for the High Earners compared to 83 per cent for Other Practitioners.

Finish of treatment: High Earners' cases had a significantly lower mean AC grade at finish ($P < 0{\cdot}0001$), and this was associated with a difference in proportions of cases left with No/Little aesthetic need; 63 per cent for the High Earners and 51 per cent for the Other Practi-

TABLE 2 *Mean and median IOTN grades at start and finish of appliance treatment*

	Aesthetic Component				Dental Health Component				Aesthetic Component Reduction		Dental Health Component Reduction	
	Start Mean (SD)	Median	Finish Mean (SD)	Median	Start Mean (SD)	Median	Finish Mean (SD)	Median	Mean (SD)	Median	Mean (SD)	Median
High earners:	7·21 (1·52)	7·0	4·04 (1·79)	4·0	3·90 (0·63)	4·0	2·95 (0·88)	3·0	3·18 (1·99)	3·0	0·96 (0·92)	1·0
Other practitioners	7·40 (1·51)	8·0	4·38 (1·63)	4·0	3·99 (0·62)	4·0	2·99 (0·86)	3·0	3·03 (1·85)	3·0	1·00 (0·92)	1·0
Probability (Mann–Whitney):	$P<0·03$		$P<0·0001$		$P<0·01$		$P>0·3$		$P<0·1$		$P>0·4$	

tioners. There were no significant differences between groups for DHC grade at finish ($P > 0·1$), and there were no significant differences in reduction of AC or DHC grades at the $P < 0·05$ level.

'Unnecessary' Treatments and Cases with Residual Need for Treatment (Fig. 2).

Unnecessary treatments: no statistical differences were detected in levels of treatment of patients with low overall objective need for treatment, *i.e.* those with a DHC grade of 3 or less *and* an AC grade of 4 or less, described by Richmond *et al.* (1993) as 'Unnecessary' treatments. The incidence of these treatments overall was under 4 per cent.

Residual need for treatment: considering cases for whom there would still have been some justification for orthodontics after completion of treatment (an AC grade of 8 or more, or a DHC grade of 4 or more, *or* a residual DHC grade of 3 or more *and* an AC grade of 5 or more), High Earners left fewer cases in this category than Other Practitioners (46 *cf* 55 per cent, $P < 0·001$).

Evaluation of Cases by the PAR Index

Table 3 shows the descriptives for the PAR data, before and after treatment, as well as the categories of improvement. As can be seen from the standard deviations, the ranges for the descriptive variables, especially the percentage reduction, were quite wide.

Category of improvement. Approximately one-fifth of cases were Greatly Improved according to the PAR Index, and a similar number Unimproved. Chi squared tests showed no differences according to caseload *($P >$* 0·4).

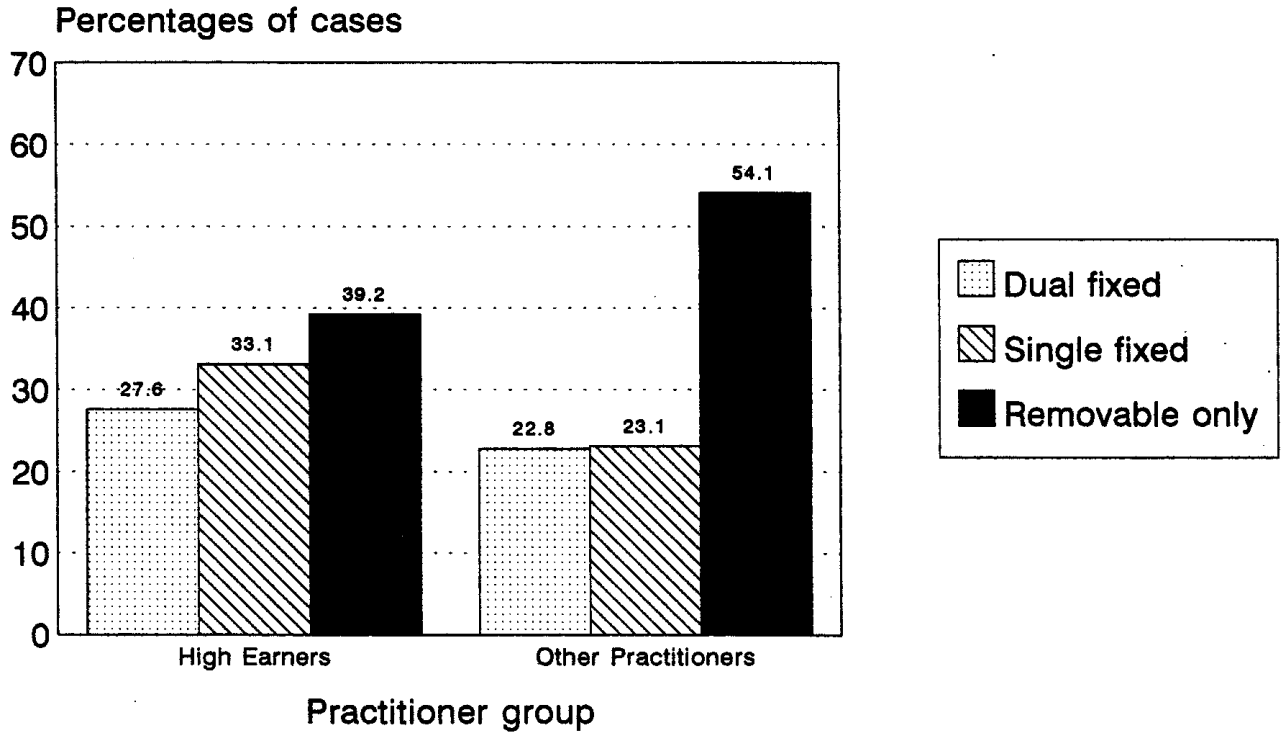

FIG. 1

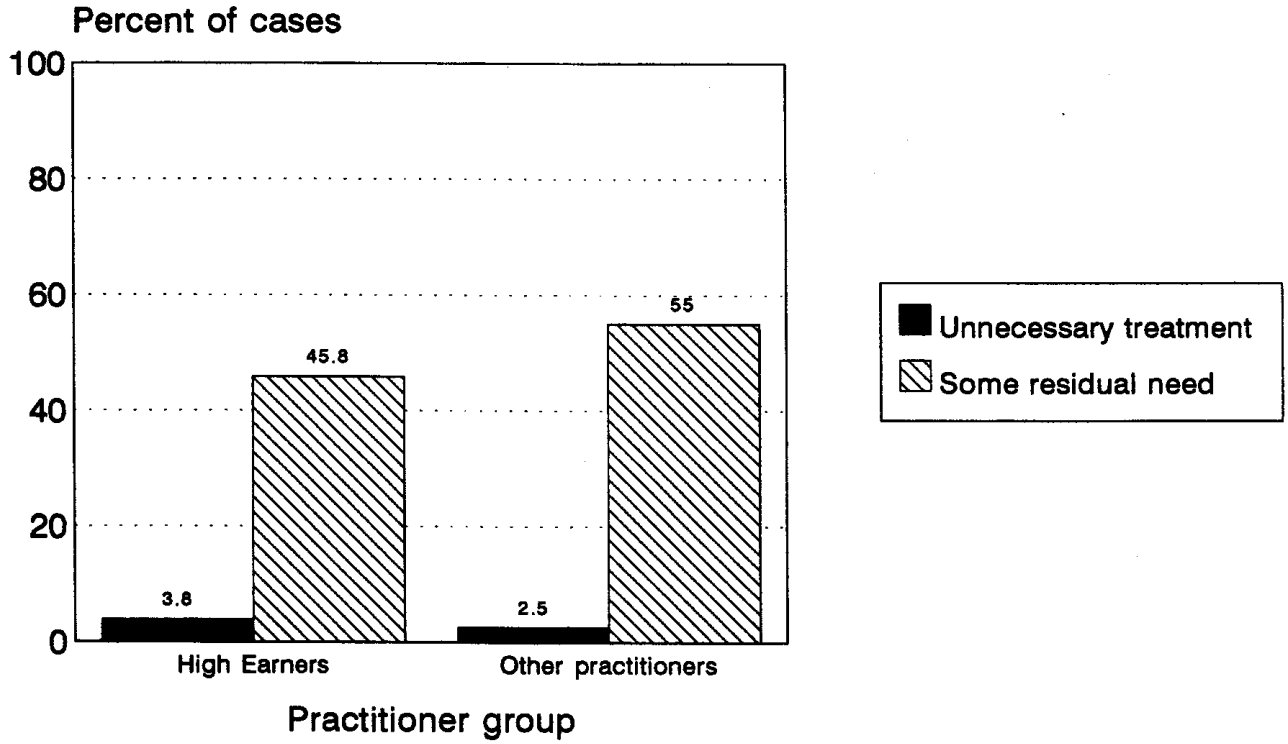

FIG 2

TABLE 3 *Descriptive PAR data and categories of improvement*

	Start PAR score		Finish PAR score		Reduction in PAR score		Percentage Reduction in PAR		Category of improvement by PAR nomogram (%)		
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	Unimproved	Improved	Greatly Improved
High earners	26·24	(10·40)	12·38	(7·50)	13·96	(10·88)	48·04	(33·69)	23·1	55·3	21·6
Other practitioners	27·23	(10·19)	12·98	(7·32)	14·25	(10·72)	47·32	(33·32)	21·4	55·9	22·6

TABLE 4 *Multivariate analysis for starting PAR score*

Source of variation	Sum of squares	Degrees of freedom	Mean squares	*F* value	Significance of *F*
Unexplained	160380·26	1524	105·236		
High earner (or not)	305·79	1	305·87	2·91	0·088
Ortho qualification	25·71	1	25·71	0·24	0·621
Total	160688·04	1526	105·30		

Starting PAR score. The results of the ANOVA are shown in Table 4. The model was weak, with only a small proportion of the sums of squares explained. High Earners tended to treat patients with slightly lower starting scores, but the difference was only of the order of one PAR point ($0{\cdot}05 < P < 0{\cdot}1$).

Finishing PAR score. The results of the General Factorial ANOVA for $\log_{10}$ Finishing PAR score are shown in Table 5. The strongest effect was the appliance type, with dual arch fixed leaving least malocclusion remaining and removable/other appliances the most. The second strongest effect was the covariate, $\log_{10}$ Starting PAR: the higher this was, the higher the residual PAR score, and a similar but weaker effect was seen for DHC grade at start. The effects of both orthodontic qualification and caseload failed to reach significance ($P > 0{\cdot}1$), as did AC category, which was removed from the final model. The model left much of the variance unexplained, however, and was of limited linearity ($R^2 = 0{\cdot}22$).

Reduction and Percentage Reduction in PAR. See Tables 6 and 7. The model for reduction in PAR was the stronger model ($R^2 = 0{\cdot}63$), but in both, the starting PAR score

TABLE 5 *Multivariate analysis for log_{10} Finish PAR score*

Source of variation	Sum of squares	Degrees of freedom	Mean squares	*F* value	Significance of *F*
Within and residual	87·98	1519	0·06		
Log_{10} start PAR (covariate)	6·73	1	6·73	116·19	<0·0005
Appliance type	15·96	2	7·98	137·75	<0·0005
DHC	0·84	2	0·42	7·27	0·001
Ortho qualification	0·08	1	0·08	1·32	0·250
Caseload	0·02	1	0·02	0·33	0·567
Total	113·17	1526	0·07		
Adjusted R^2 value:	0·219				

Group means adjusted for covariance

	Mean log_{10} Finish PAR	Geometric mean Finish PAR
Appliance type:		
Dual arch fixed	0·89139	7·79
Single arch fixed	0·98225	9·60
Removable/other	1·12262	13·26
DHC at start:		
3 or less	0·93694	8·65
4	1·03008	10·72
5	1·13694	13·71
Ortho qualification	1·00411	10·10
No ortho qualification	1·01360	11·37
Caseload:		
High earner	1·00713	10·17
Other practitioner	1.03943	10.95

TABLE 6 *Multivariate analysis for reduction in PAR score*

Source of variation	Sum of squares	Degrees of freedom	Mean squares	*F* value	Significance of *F*
Within and residual	64503·76	1519	42·46		
Start PAR (covariate)	73716·51	1	73716·51	1735·95	<0·0005
Appliance type	10772·17	2	5386·09	126·84	<0·0005
DHC	559·71	2	279·86	6·59	0·001
Ortho qualification	79·90	1	79·90	1·88	0·170
Caseload	69·58	1	69·58	1·64	0·201
Total	176993·05	1526	115·98		
Adjusted R^2 value:	0·634				

Group means adjusted for covariance

	Mean reduction in PAR
Appliance type:	
Dual arch fixed	20·33
Single arch fixed	13·34
Removable/other	10·58
DHC at start:	
3 or less	7·78
4	15·30
5	17·39
Ortho qualification	14·83
No ortho qualification	13·48
Caseload:	
High earner	14·11
Other practitioner	14·61

TABLE 7 *Multivariate analysis for (log_{10} FPAR – log_{10} SPAR) as approximation to percentage reductions in PAR*

Source of variation	Sum of squares	Degrees of freedom	Mean squares	*F* value	Significance of *F*
Within and residual	87·98	1519	0·06		
Log_{10} start PAR (covariate)	13·35	1	13·35	230·55	<0·0005
Appliance type	15·96	2	7·98	137·75	<0·0005
DHC	0·84	2	0·42	7·27	0·001
Ortho qualification	0·08	1	0·08	1·32	0·250
Caseload	0·02	1	0·02	0·33	0·567
Total	123·85	1526	0·07		
Adjusted R^2 value:	0·286				

Group means adjusted for covariance

	Mean (log_{10} FPAR – log_{10} SPAR)	Mean antilog converted to mean percentage
Appliance type:		
Dual arch fixed	−0·54951	71·78%
Single arch fixed	−0·36875	57·72%
Removable/other	−0·27312	46·68%
DHC at start:		
3 or less	−0·29157	48·90%
4	−0·39117	59·37%
5	−0·35567	55·91%
Ortho qualification	−0·38957	59·22%
No ortho qualification	−0·34088	54·38%
Caseload:		
High earner	−0·36913	57·26%
Other practitioner	−0·36118	56·47%

(or its logarithm) and the most effect: the higher the starting score the greater the reduction and percentage reduction tended to be. This effect was followed by the appliance type, where dual arch fixed showed the greatest reductions and percentage reductions, then DHC at start, which again paralleled the effect of starting PAR score, *i.e.* the higher the grade, the greater the reduction and percentage reduction. For neither model was the effect of orthodontic qualification or caseload of any significance ($P \geqslant 0{\cdot}17$).

Discussion

This study was undertaken because high-earning practitioners have a high turnover of patients, and it has been inferred that they may tend to 'over-prescribe and under-treat'. This suggestion was presumably made because of the poor standards noted by the 'Schanschieff Report' (DHSS, 1986).

Our results suggest that, although 'High Earners' had slightly lower entry thresholds to treatment in terms of IOTN grades, the differences noted were of little clinical significance. Furthermore, as they did not treat significantly more cases in the category of low overall objective need described by Richmond *et al.* (1993) as 'Unnecessary treatments', they could not be considered to be over-prescribing; neither were they seen to be selecting cases who would be quick to treat, as their mean treatment time was the same as that of the other practitioners.

High Earners were more likely to be orthodontically qualified, and carried out substantially more fixed appliance treatments than other practitioners. This is consistent with them being in the 'top twenty' earners from orthodontics—to fall within this category, one would expect them to spend most, if not all their clinical time in orthodontics, thus it is likely that they are specialist practitioners, and their more frequent use of fixed appliances is consistent with the findings of O'Brien and Corkill (1990), who showed that specialist practices were well geared to orthodontics. However, given their appliance usage, it is disappointing that their outcomes were not really any different to other practitioners. Although small, but statistically significant differences were seen in (lower) residual AC and DHC grades, and levels of residual overall need for treatment, these are almost certainly linked to the lower IOTN grades at start, as no substantial differences were detected in reduction of AC or DHC grades. No differences of any clinical or statistical significance were detected in the PAR outcome measures, and here the findings of this study differ from those of Kelly and Springate (1996) who found specialist practitioners to have better treatment standards than previously detected in the GDS by Richmond *et al.* (1993). Their sample was, however, smaller, and rather localised.

Implications for improving treatment standards. What does emerge from this study is the effect of appliance type on outcome, as well as the effects of levels of malocclusion and need for treatment at start. Fixed appliances, notably dual arch fixed, are the most effective, as previously noted by Jones (1991a,b), Richmond *et al.* (1993), O'Brien *et al.* (1993), Fox (1993) and Turbill *et al.* (1996).

High levels of malocclusion and need for treatment at start were associated with larger reductions and percentage reductions in PAR score, but it is a limitation of GDS orthodontics that they were also linked to higher residual PAR scores. With a mean residual score of 12 and percentage reduction of 48, overall standards could only be described as mediocre.

Whilst it may be effective for financial restraint to restrict the activities or fees of high-earning orthodontists, it could not be defended unless they were either over-prescribing or producing poorer standards. In fact their levels of 'unnecessary' treatments, and their standards of outcome were similar to other practitioners. They could, effectively, be said to be making up the shortfall in numbers of orthodontists: they work with large caseloads, and produce standards which are at least as good as those of other practitioners whose incomes are more modest. Any attempt to reduce their caseloads would reduce the availability of their treatment to patients indiscriminately, unless some system of prioritization was also employed. Concern has been raised, however, at the harmful effects on mental health of caseload pressures in the GDS (Cooper *et al.*, 1987; Osborne and Croucher, 1994), and it is undesirable that a practitioner should be forced to work at a pace which, for him/her, is not conducive to a good quality of working life, or production of good standards. Whilst the information was not available to us as to how many 'High Earners' had assistants working under their FHSA numbers, it is inherent to the system that single-handed practitioners with high turnovers raise the expected output for all practitioners (GDSC, 1964). As long as this tendency is checked, however, it is very acceptable if some practitioners have a higher than average capacity for work.

Essentially, there is no justification to single out 'High Earners' for criticism. We suggest attention should be directed, however, to the system which rewards speed of turnover rather than, and arguably often at the expense of, quality of care, to break the vicious circle of 'more work less pay' described by Tattersall (GDSC, 1964). Perhaps this could be done by rewarding practitioners whose standards were regularly higher than 'adequate', as was suggested by the Spens Committee in 1948.

Conclusions

Our findings concur with earlier studies, that appliance type has a marked effect on reduction of malocclusion; dual arch fixed appliances providing the most effective treatments, and removable appliances generally the poorest. Also, cases with high levels of malocclusion and/or need for treatment at start showed larger reductions and percentage reductions in PAR, but sadly also higher residual scores.

High earning orthodontists accepted more cases with lower levels of treatment need, but they did not treat any more cases 'Unnecessarily' and they were more likely to use fixed appliances, including dual arch fixed, than others in the GDS. Although they left slightly fewer cases with some residual need for treatment, this may be explained, largely, by lower levels of need at start.

Overall, high earning orthodontists' standards were little different to other practitioners, and there would be no justification for focusing special restrictions on their activities. Perhaps consideration should be given to changing the system which has tended to favour high throughput of mediocre treatments, to encourage all in the GDS to improve their proficiency in the speciality.

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