Evaluation of personal dental services (PDS) first wave pilots: the alternative to general dental services (GDS) offered by the capitation-based pilots

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Introduction

> "What is required is a fundamental change in the system of dental remuneration. To go from the Scylla of item of service (overprescribing) to the Charybdis of capitation (supervised neglect) at least has the advantages that it can be monitored and policed in a far more effective manner." (Gordon, 1982, p9)

General Dental Services

In 1963, the General Dental Services Committee of the British Dental Association appointed a sub-committee to explore alternative methods of remuneration for general dental practitioners (GDPs). The resulting report (Tattersall et al, 1964, p331) declared that "there is no future for the profession, or indeed for general dental practice as an art and a science, in the system of remuneration as presently operated". Since its introduction in 1948 to the present day, this system of remuneration has remained largely unaltered for GDPs' care of adults. In 2000/01, 89% of GDPs' gross income relating to adult patients came from fees for over 400 items of service (Dental Practice Board, 2001).

Before 1994/95 the level of fees for items of service are set annually by the government in order to meet a 'target average net income' (TANI) for GDPs.[1] The "higher the volume of dental activity forecast by the DRSG the lower the fees set within parameters effectively pre-determined by the DDRB" (Bloomfield, 1992, p19).[2] In 1994, the Review Body on Doctors' and Dentists' Remuneration decided not to recommend a TANI because the "instability and unpredictability of the payments system make it impossible to foresee what effect such a recommendation on TANI would have on the level of fees"

[1] The Review Body on Doctors' and Dentists' Remuneration (RBDDR) recommended the TANI, and the Dental Rates Study Group (DRSG) recommended the level of fees, and, from 1990, payments for adult continuing care and child capitation, necessary to deliver the TANI to the 'average' GDP. The DRSG's recommendation entails forecasting dentists' total activity and practice expenses, top-slicing for allowances including maternity pay, and a balancing mechanism which allows for correction of over or under payments in previous years. The income for many GDPs varies greatly from the 'average' GDP constructed for the purpose of setting net income, because of the wide range of hours worked, volume and mix of treatment, and practice expenses (Tattersall et al, 1964; Bloomfield, 1992).

[2] Tattersall et al (1964, p332) emphasised that no individual dentist will know how he is performing relative to the average, but simply that "the faster he personally works the greater will be his pay cheque next month. … A fixed itemised scale under the existing conditions puts a premium on speed and takes no account of quality. Therefore standards tend to fall, there is no incentive to practice the higher more time-consuming techniques, and the profession becomes pre-occupied with 'turnover' and generally more commercially than professionally minded. Since quantity is the main criterion, the less scrupulous are tempted to indulge in over-prescription and other dubious practices".

(RBDDR, 1994, p34). Instead the RBDDR recommended an direct increase in the gross item-of-service fees and the child capitation payment.

Tattersall et al (1964, p340) outlined an alternative system of remuneration based on capitation payments with an element of fee-for-service payments for complex treatment[3], which would

> "encourage the dental surgeon to exercise his real function in the community, which is to secure *and maintain* dental fitness. Usually this will involve some operative treatment, but often it will involve little beyond regular inspection, prophylaxis, and expert advice".

The Tattersall Report did not provoke a rapid change in policy relating to adult care[4]. Nevertheless, following the Royal Commission on the National Health Service (1979), a Dental Strategy Review Group (DSRG) on the development of dental health policy suggested that

> "conditions are now right to initiate changes that will lead to a substantial improvement in the future dental health of the nation. The reduction in the level of dental caries coupled with a fall in the child population and an increase in the size of the profession has brought the overall problem within the possibility of control. However, … a change of attitude and motivation towards prevention [will be required]. Inherent in this will be the need to encourage practitioners to limit clinical intervention to the absolute minimum and give prevention the opportunity to work" (DSRG, 1981, p10).

The DSRG (1981) advocated the recommendation of the Committee on Child Health Services (Court et al, 1976) that funding care for children on the basis of capitation should be piloted. A one year pilot of a child capitation scheme was followed by a three-year clinical trial which ended in June 1989 (Coventry et al, 1989). This study found that the capitation-funded dentists filled fewer teeth, "restored carious teeth at a later stage in the disease process than fee-for-service controls, and carried our more preventive treatment and advice. However, the disease experience of their patients was little

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[3] Tattersall suggested that all patients aged four years and over and not edentulous could be included in the scheme once a 'certificate of dental fitness' had been issued on completion of a course of treatment. Patients with dental fitness certificates would secure capitation payments for the dentist for two years from the date of certificate issue. A dentist seeing a patient with a valid certificate would be required to issue a new dental fitness certificate on completion of the course of treatment. A patient failing to report for examination within two years of the date of the last fitness certificate "would be required to have his mouth put in order at his own expense before regaining eligibility for treatment under the capitation system" (Tattersall et al, 1964, p341). The capitation fee would cover all routine 'maintenance' treatment, while complex treatment would be funded on a fee-for-service basis.

[4] For example, following the Royal Commission on the National Health Service (1979), the DSRG report on the development of dental health policy concluded that

> "Bearing in mind that the present system of remuneration has been tested over a number of years and has been shown to be an economic method of providing items of treatment, we can see no ready alternative to the fee per item of service for adults and would recommend its retention for the time being" (DSRG, 1981, p23).

The committee of enquiry into unnecessary dental treatment (Schanschieff et al, 1986, p52) concluded that "we do not regard the scale of deliberate unnecessary treatment to be so widespread as to require radical solutions". The report was cautious about changes in remuneration methods, citing DSRG (1981) on the rationale for continuing fees per item of service for adults, and reserving comment on child capitation while it was being piloted. "For our part we can see that whilst the capitation system would destroy the incentive for a dentist to overtreat, it might well provide an incentive to those dentists who were not conscientious to undertreat the patient" (Schanschieff et al, 1986, p53).

different from that of patients treated under fee-for-service"" (Coventry et al, 1989, p7). Coventry et al (1989, p7) also reported that:

> "The profession felt that capitation offered clinical freedom and more financial stability to dentists, but a greater temptation to under-prescribe treatment. The profession lacked commitment to capitation as a method of remuneration for the treatment of children in the General Dental Service. …. Fee-for-service dentists appeared to be more innovative, expressed a greater allegiance to their patients and felt a greater temptation to over-prescribe than capitation dentists".

The child capitation study informed negotiations between the Department of Health and the British Dental Association about a revised contract for GDPs, and a capitation system for children was introduced with a new contract in October 1990[5]. The 1990 contract also introduced 'continuing care' payments for registered adult patients: a 'retainer' designed to foster a continuing relationship between dentist and patient which accounted for 11% of gross fees relating to adults in 2000/01 (Dental Practice Board, 2001).

In 1992, Bloomfield reiterated Tattersall's criticism of remuneration on the basis of fee-for-service[6] and suggested that purchaser/provider contracting based on capitation with an element of fee-for-service could be used to address local dental priorities. Bloomfield's proposals influenced further reports (Roe, 1993; Department of Health, 1994) which led to the announcement, in 1995, that local commissioning of general dental services would be piloted. In 1997, *Choice and Opportunity* (Department of Health, 1997) and the NHS (Primary Care) Act, 101 expressions of interest were received from 65 health authorities. Of these, 15 were approved to commence as the first wave Personal Dental Services (PDS) pilots on 1 October 1998.

Personal Dental Services Pilots

Each PDS pilot holds a contract for dental services which was agreed between the local health authority and one or more providers of dental services. A range of remuneration arrangements were developed. Four pilots were formed by GDPs wishing to provide general dental services using remuneration arrangements based on capitation. Five pilots were formed by NHS trusts wishing to offer general dental services via the introduction of salaried dentists. Four pilots provide specialised services, which have not followed a common funding format, and two small pilots aimed to expand primary dental services using a block contract[7].

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[5] The capitation system incorporates improvements on the model piloted (Mellor and Holloway, 1991), and includes annual capitation fees in five age bands designed to cover routine care. The initial fees ranged from £5.04 for children aged 0 to 2, to £40.08 for those aged 15 to 17. Non-routine care continued to be funded by fees-for-service, and in 1996, a separate fee for fillings was reintroduced for children in response to concern that this activity required promotion. The capitation fees represented 52% of gross fees relating to children in 2000/01.

[6] Remuneration based on fee-for-service "may have a depressing effect on standards of dental care" as dentists argue that to earn the 'target average net income' they must increase "their work-rate, with a real danger of the "treadmill effect". This can lead to an undesirable cutting of corners" (Bloomfield, 1992, pp25-26).

[7] One of the pilots holding a block contract initially intended to introduce a total capitation system for child care. However, the lead Primary Care Group took an early decision to move the contract to a block arrangement in order to simplify performance management.

All the pilots shared objectives related to access, which can be categorised as seeking to improve access in response to high levels of demand for services or to promote access and the use of services by high needs groups demonstrating low levels of demand for care (Smith et al, 2000). This paper focuses on the four capitation-based pilots and forms part of a wider evaluation of the first wave PDS pilots funded by the Department of Health (Smith et al, 1999; Smith et al, 2000; Hill et al, forthcoming).

Methods

Activity data relating to the four capitation-based pilots and GDS activity in the host health authorities were supplied by the Dental Practice Board (DPB). Data on registered patients is used from December 1998. Baseline data are problematic due to difficulties relating to contract number changes following the change from GDS to PMS. Activity data for the year in which the pilots started, 1998/99, have not been used because of data quality issues.

Dental treatment type classifications (see box 1) of item of service data were used to compare each pilot's PDS activity in 2000/01 with the GDS activity in 1997/87 provided by those dentists who subsequently went into the pilot.

Item of service data were used to compare treatment rates for the most common treatments in each pilot in 1999/00 and 2000/01 with the GDS activity in 1997/87 provided by those dentists who subsequently went into the pilot. In order to facilitate a 'like for like' comparison, the DPB provided PDS activity data for these pilots which were processed using the GDS regulation criteria[8]. The difference in change in treatment rates between 1997/98 and 2000/01 for each pilot and comparator was tested for statistical significance using standard probabilistic arguments and regarding the number of items of treatment as poisson random variables.

In order to investigate the extent to which two PDS pilots may have facilitated access to patients who could be considered to be outside NHS care, the DPB identified from small samples the number of individuals registered as new patients in early 2001 who had not had contact with a GDP during the previous four years. 'New' PDS patients, for whom treatment was first recorded in one of the first three schedules of 2001 (broadly January to March 2001), were identified for two capitation-based pilots (A and B). A random sample of about 100 patients from each pilot was selected and then matched with the DPB registration database on the basis of surname, initial, gender and date of birth. As registrations are kept on the database for four years, this process provides a measure of the extent to which patients using these pilots for the first time during the first quarter of 2001 had previously been registered in the GDS system within the previous four years.

Qualitative data on each pilot were collected from the pilot lead and health authority lead in semi-structured face-to-face interviews held between February and April in 2000 and

[8] This approach means that any activity provided by the PDS pilot that would not have accrued a fee under the GDS regulations, such as child examinations, is excluded from the comparison.

2001. The pilots' contracts and annual reports to the Department of Health were examined. A range of additional data collection activity took place as part of the wider evaluation (Hill et al, forthcoming).

Results

Pilot characteristics

The four capitation-based pilots vary considerably (table 1). While both pilots A and B are located in small rural towns, Pilot A aimed to provide comprehensive care for the entire local population, Pilot B focused on adults only and formed a minority of primary dental care provision in its locality. Pilots C and D both operated in deprived urban locations and shared a stated focus on children while also including adults.

Table 1: Pilot characteristics

Pilot	Number of practices in the pilot in March 2001	Number of dentists in the pilot in March 2001		Average number of patients registered with the pilot in 2000/01		Demand for NHS dental care*	Type of locality
		principals or practice owners	associates or Vocational Trainees	adults	children		
A	8	8	11	29,203	10,937	High	small rural town
B	3	7	8	16,883	0	High	small rural town
C[1]	7	7	5	10,032	3,943	Low	deprived urban
D	7	9	16[1]	20,730	8,641	Low	deprived urban

1 Plus three community dental service dentists.

Main objective

All four capitation-based pilots had objectives to increase access to primary dental services. Pilots A and B both aimed to improve access in response to a high level of demand for care., and their objectives were expressed as targets to increase the number of registered patients. Pilots C and D both operated in deprived urban locations and experienced low levels of demand from high needs populations. These pilots did not specify targets for registration increases.

Capitation-based contracts

In each pilot, the host health authority contracted with a number of principal dentists (practice owners), referred to as 'providers' in the contracts. The arrangements made by the capitation-based pilots are briefly outlined below. Local contract development was subject to two criteria. First, the provider dentists had to be funded at a level that at least matched their pre-pilot GDS income. Second, patients treated in any pilot continue to be charged the same patients' charges as would apply within NHS GDS.

Pilot A: A 'baseline' payment is paid to each of the providers by the health authority. The baseline payments were set at a level so as to match the historical GDS non-patient fee income of the providers. Net increases in the number of registered patients attract annual 'growth' payments of £50 for children and exempt patients and £30 for fee-paying patients. Growth payments were initially calculated for each six month period, and later

calculated on a monthly basis. The higher rate for growth payments to exempt patients compared with fee-paying patients is intended to balance the financial reward of treating these two patient groups over a period of about four years. Associate dentists working in the pilot are paid on a fee-per-item basis by the provider dentists. One of the nine provider dentists left the pilot in early 2001.

Pilot B: This pilot is limited to adults. For newly registered patients, fees per item of treatment are payable, at the GDS rates, for the first course of treatment provided. On completion of the first course of treatment monthly capitation fees become payable. The level of the capitation payments is teeth-related. Patients with some natural teeth are paid at a rate equivalent to an annual payment of £29.76. Patients with no natural teeth are paid at a rate equivalent to an annual payment of £14.88. The capitation payments are subject to bi-annual review and cover a specified range of common treatments. All payments made to the pilot are net of patient charges collected. All associate dentists are funded on the basis of the capitation fees.

Pilot C: The level of the capitation payments is age-related and equivalent to annual payments ranging from £16.92 for children aged up to two, to £50.88 for children aged 13 to 17. The capitation payments are made on a monthly basis and cover a specified range of common treatments. Some activity attracts fees per item of treatment in line with the GDS payment schedule. Endodontic treatment and complex periodontal treatment are paid at the GDS rates plus 10%. Three dentists left the pilot during 2000/01.

Pilot D: In addition to setting baseline payments so as to match the historical income of the providers due under the GDS regulations, the level of growth payments for additional registrations was initially also set so as to match the historical GDS income. This resulted in practice-level annual growth payments varying from £46 to £70 per additional registration. From September 2000, the funding arrangement was changed. Since then 70% of the funding per registration has been set at the same level across all the practices in the pilot, and 30% has been weighted by the Jarman score based on the location of the patient's residence. This approach has resulted in an average annual payment of £63 per registration (range £60 to £64). Funding is calculated using registration data on a monthly basis. The associate dentists in this pilot are funded through a range of mechanisms from salaried to capitation or a mixture of capitation and fee-per-item. In addition, some of the pilot's activity is carried out by salaried staff seconded from the Community Dental Service.

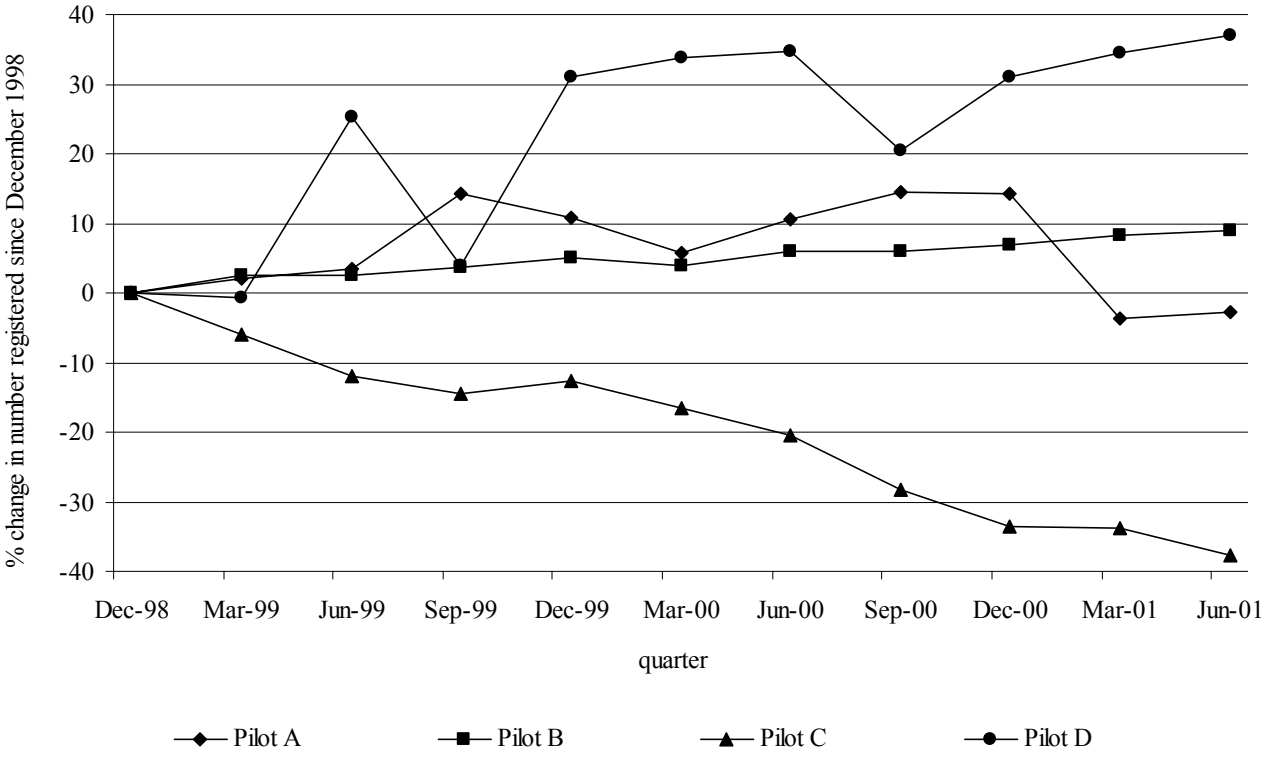
Access to primary dental care

The capitation-based pilots expressed their aims to increase access in terms of registrations, which was therefore a key measure for these pilots. Figure 1 shows the change in registrations between the quarter ending December 1998 and June 2001.

Pilot A: The initial target was to increase registrations by 15% per annum. The number of registrations increased by 14% between December 1998 and September 1999. Further increases were not realised and the pilot forecast a 4% increase in net registrations in

2001/02. The health authority lead for the pilot reported that the pilot had achieved its objective to "provide unhindered access to NHS dental services to the residential population". Complaints by members of public to the health authority about the unavailability of NHS dentists in the locality were reported to have ceased. The overall increase in registrations to March 2001 was limited due to one of the nine practices leaving the pilot in early 2001 (see discussion).

Figure 1: change in total patient registrations for the four capitation-based pilots



Pilot B: The pilot's initial target was to increase registrations by 18% between October 1998 and March 2000, and it experienced an increase of 9% over this period. The target increase for 2000/01 was 11%, and it experienced an increase of 4% over this period based on data presented in the pilot's annual report (or 2% based on DPB data). The pilot's 2000/01 annual report states that there were no availability problems in the designated area, and so the pilot had "completely" reached its target population.

Pilot C: This pilot did not set specific targets for registrations although an increase in registrations was an objective, particularly for children. The pilot experienced a reduction in the number of participating dentists and this accounts for an overall reduction in registrations of 34% between December 1998 and March 2001. However, the number of child registrations increased by 29%, and the number of adult registrations increased by 1%, during this period for dentists that remained in the pilot (figure 2).

Pilot D: The pilot did not report registration targets, although increasing registrations for children was a particular objective. Pilot D experienced the largest increase in

registrations. This is in part due to the pilot increasing the registration period from 15 to 24 months. The number of child registrations increased by 45%, and the number of adult registrations increased by 30%, between December 1998 and March 2001 (figure 3).

Figure 2: change in child and adult registrations in Pilot C

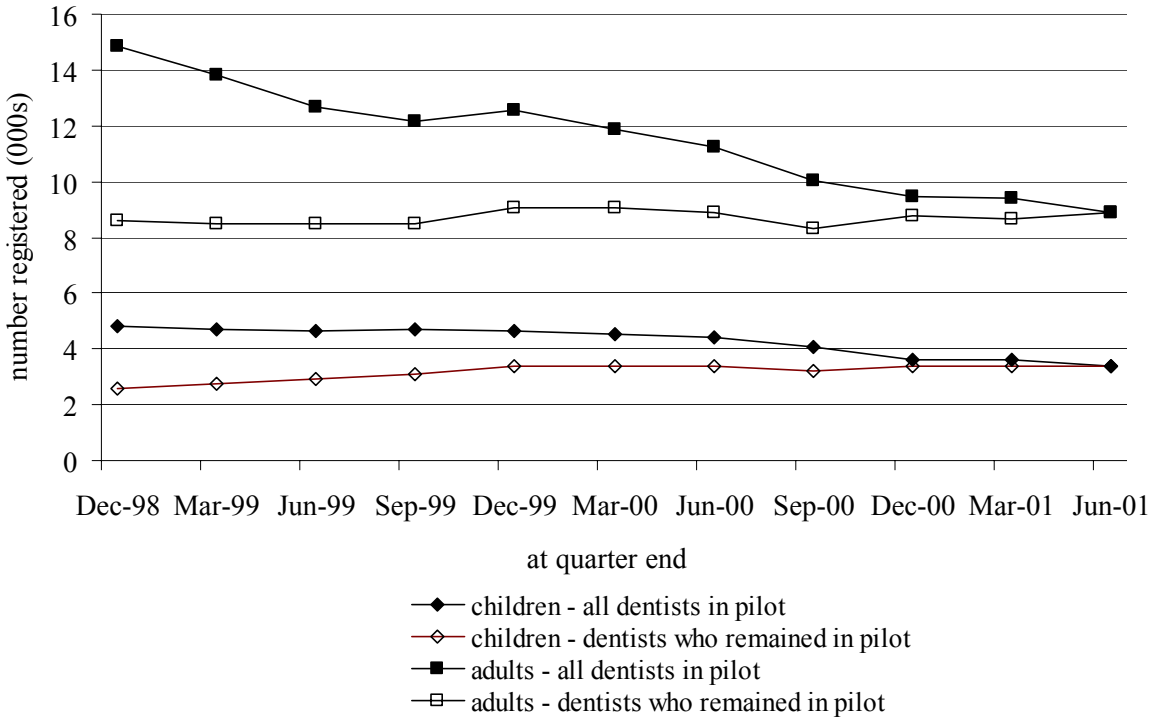
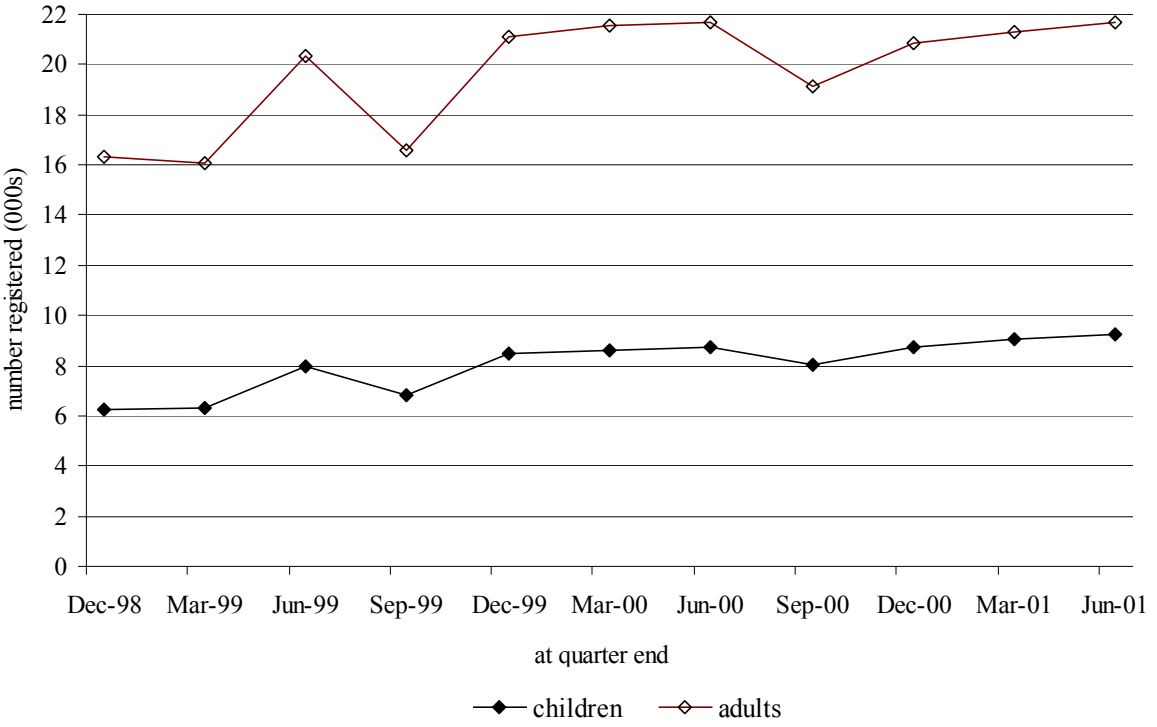


Figure 3: change in child and adult registrations in Pilot D



The dip in registrations in the quarters ending September 1999 and September 2000 was reported by the health authority lead to be due to vocational trainees leaving post and their patients not being immediately reregistered (figure 3).

Access for patients considered to be outside NHS care

The use of changes in the number of net registrations to measure the extent to which the pilots have facilitated an increase in access to NHS primary dental care provides, at best, a partial picture. In practice, the volume of patients de-registered each month because they have not attended for 15 months is high, as is the number of 'new' patients who are registered having been de-registered for some time due to non-attendance. In order to investigate the extent to which the PDS pilots may have facilitated access to patients who could be considered to be outside NHS care, the DPB estimated the proportion of 'new' patients during the first quarter of 2001 who did not have a GDS registration within the previous four years in Pilots A and B. This limited analysis indicates that after more than two years in operation, Pilots A and B were facilitating access to patients who had not recently received NHS dental care (table 2).

Table 2: Pilots A and B: new PDS patients and previous GDS registrations

Pilot	number of 'new' patients found during first quarter of 2001	number of patients in sample	number of patients with no prior GDS registration during previous 4 yrs	% of patients with no prior GDS registration (95% CIs)	
A	2,639	95	42	44.2	(34.2 to 54.2)
B	946	97	51	52.6	(42.6 to 62.5)

Source: DPB data

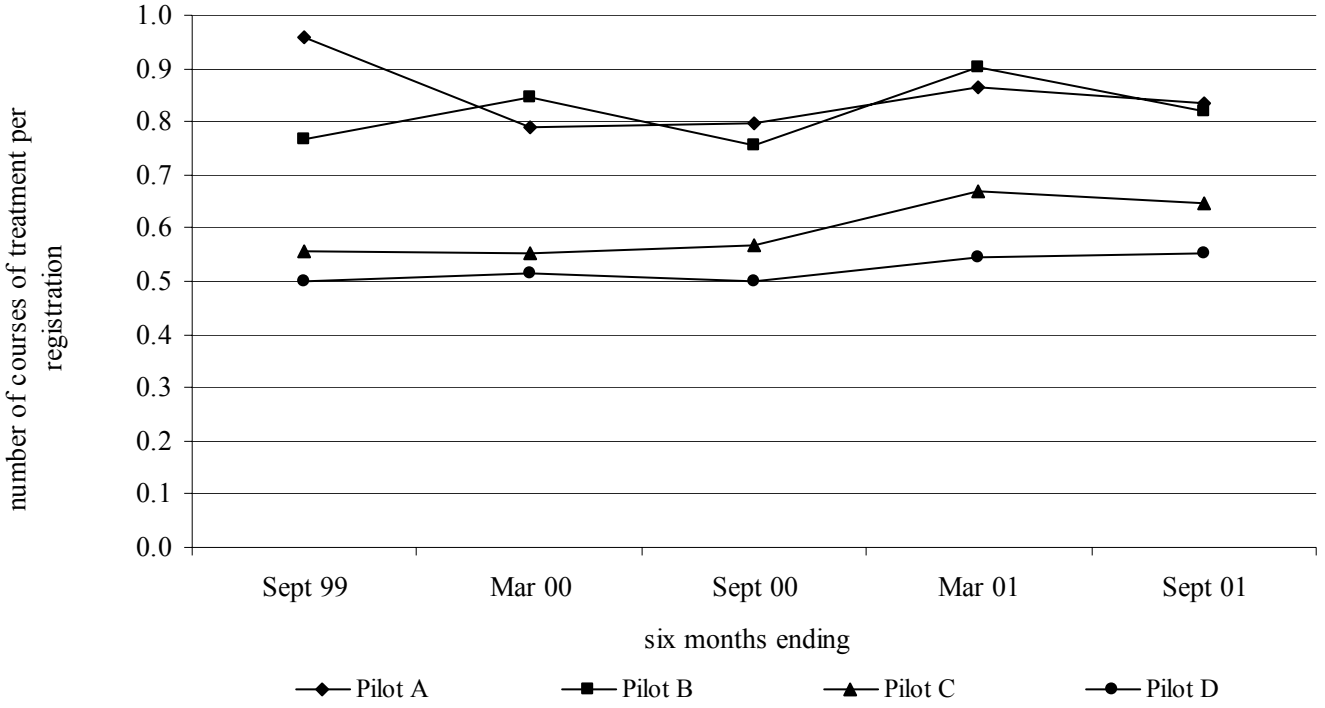
Courses of treatment

The average number of completed courses of treatment in each six-month period between the six months ending September 19999 and September 2001 is shown in figure 4. The two 'high demand' pilots (A and B) experienced a higher number of completed courses of treatment compared to the 'low demand' pilots. It is interesting that Pilot C's experience is similar to Pilot D's experience given that the registration period for Pilot D is 24 months compared to the other pilots' registration period of 15 months.

Patterns of care by treatment type

Some insight into the pattern of treatment provided by these pilots is provided by comparing the PDS activity provided by each pilot with the GDS activity provided by those dentists who subsequently went into the pilot. In order to facilitate a 'like for like' comparison, the DPB provided the evaluation team with a set of activity data for these pilots in 1999/00 and 2000/01 which were processed using the GDS regulations. This approach means that any activity provided by the PDS pilot that would not have accrued a fee under the GDS regulations is excluded from the comparison. Furthermore, it is important to note that the incentive to collect these data is different under GDS and PDS. Table 3 uses data grouped into seven treatment types used by the DPB and described in box 1.

Figure 4: Average number of courses of treatment per registration for the four capitation-based pilots[1]



1 Data reported on the monthly activity returns (MARs) produced by the DPB. The data covering the year to March 2000 have been discounted by a pilot-specific factor calculated by the DPB which is intended to account for double counting of activity data during this period due to data collection and transmission problems.

Box 1 Dental treatment types

type	title	content
1	Intricate work	Case assessment, surgical periodontal, veneers, inlays, crowns, bridges, orthodontic appliances, obturators
2	More than routine	Non-surgical periodontal, endodontics, surgical removals, root canal and pulp extirpation, temporary bridges, temporary crowns
3	Dentures	Dentures (including incomplete)
4	Routine work	Two visit periodontal, fillings, extractions, post-operative care, general anaesthetic, pre-operative scaling, domiciliary visits, recalled attendance, acute condition, dressings, abscess, relative analgesia
5	Repairs/refixing	Repairs, refixing, recementing: inlays, crowns, bridges, dentures and obturators, orthodontic study models
6	Miscellaneous	Pathological/bacteriological examination, stoning, sensitive cementum, occlusal equilibration, prescription, referral, other treatment
7	No dental intervention	Examination, simple scaling, x-ray, transfer, fissure sealant, topical fluoride

Source: DPB

Table 3 shows that Pilots A and D share a trend to reduce the proportion of activity classified as 'intricate work' and to increase the proportion of work classified as 'no dental intervention'. While the Pilot B also shows an increase in the proportion of activity classified as no dental intervention, the proportion of intricate work was maintained. This finding is consistent with the pilot's financial incentives because intricate work attracted fee for service payments in the Pilot B. Pilot C experienced little change in the proportion of intricate work, but experienced a substantial move from the routine work classification to no dental intervention. What is not known is whether activity moved into the private sector, resulting in reduced NHS activity, since data on private activity are not available.

In addition to the changes in proportion of the different treatment classifications, table 3 also shows the changes in the number of item of service 'claims' (not necessarily resulting in a linked payment, depending on the item and the pilot) for each treatment category between 1997/8 and 2000/01. Pilot A experienced the largest increase in activity by this measure (43%), and Pilot C experienced the largest reduction in activity (42%). These changes will in part be due to the difference between the number of dentists working in 1997/98 who subsequently went into the pilot and number of dentists working in the pilot in 2000/01.

Table 3 Comparison of item of service claims in 1997/98 and 2000/01

	Number of item of service claims in each treatment type			Percentage of item of service claims in each treatment type		
Pilot A	1997/98[1]	2000/01[2]	% change	1997/98	2000/01	change in %
type 1 Intricate work	1383	1167	-15.6	3.9	2.3	-1.6
type 2 More than routine	1255	1476	17.6	3.5	2.9	-0.6
type 3 Dentures	1147	1125	-1.9	3.2	2.2	-1.0
type 4 Routine work	13878	16023	15.5	38.7	31.3	-7.4
type 5 Repairs/refixing	1257	1339	6.5	3.5	2.6	-0.9
type 6 Miscellaneous	431	439	1.9	1.2	0.9	-0.3
type 7 No dental intervention	16524	29698	79.7	46.1	57.9	11.9
total	35875	51267	42.9	100.0	100.0	0.0
Pilot B						
type 1 Intricate work	793	712	-10.2	2.5	2.6	0.1
type 2 More than routine	373	315	-15.5	1.2	1.1	0.0
type 3 Dentures	740	650	-12.2	2.3	2.3	0.0
type 4 Routine work	9974	7856	-21.2	31.2	28.4	-2.8
type 5 Repairs/refixing	979	576	-41.2	3.1	2.1	-1.0
type 6 Miscellaneous	387	171	-55.8	1.2	0.6	-0.6
type 7 No dental intervention	18685	17394	-6.9	58.5	62.9	4.3
total	31931	27674	-13.3	100.0	100.0	0.0
Pilot C						
type 1 Intricate work	1887	1128	-40.2	7.8	8.0	0.2
type 2 More than routine	2349	1175	-50.0	9.7	8.3	-1.3
type 3 Dentures	757	326	-56.9	3.1	2.3	-0.8
type 4 Routine work	11225	4109	-63.4	46.1	29.1	-17.0
type 5 Repairs/refixing	782	483	-38.2	3.2	3.4	0.2
type 6 Miscellaneous	422	63	-85.1	1.7	0.4	-1.3
type 7 No dental intervention	6904	6838	-1.0	28.4	48.4	20.0
total	24326	14122	-41.9	100.0	100.0	0.0
Pilot D						
type 1 Intricate work	1933	1146	-40.7	9.1	4.5	-4.6
type 2 More than routine	1917	1774	-7.5	9.0	6.9	-2.1
type 3 Dentures	632	700	10.8	3.0	2.7	-0.2
type 4 Routine work	9312	11991	28.8	43.8	47.0	3.2
type 5 Repairs/refixing	850	902	6.1	4.0	3.5	-0.5
type 6 Miscellaneous	344	425	23.5	1.6	1.7	0.0
type 7 No dental intervention	6270	8594	37.1	29.5	33.7	4.2
total	21258	25532	20.1	100.0	100.0	0.0

1 GDS activity for dentists who subsequently went into the PDS pilot.

2 PDS activity (processed by the DPB using GDS regulations) for all dentists in the pilot.

The chi-squared test for association indicates that for each pilot there is an association between classification type and year ($p<0.01$).

Table 4 summarises the treatment rates for the most common items of treatment for adults in three of the capitation-based pilots[9]. The treatment rates are based on the number of adult registrations (the mean of the number of registrations at the end of the four quarters in each year). The table includes the GDS treatment rates in 1997/98 for the dentists that subsequently went into the PDS pilots. Treatment rates for all dentists working in the pilots in 1999/00 and 2000/01 are shown. Rates for 1998/99 are not shown because the pilots started during this year and the activity data are problematic. In addition to the treatment rates for the pilots, treatment rates are also shown for comparator GDS activity within the host health authorities[10]. Table 4 also shows the change in the treatment rates between 1997/98 and 2000/01 for both pilots and comparators. The final column of Table 4 shows the difference in change in rate between the pilot and its comparator.

The GDS registration period for adults changed from two years to 15 months on 1 September 1996. This change means that registration data for 1997/98 are inflated in comparison to registration data for 1999/00 and 2000/01, and treatment rates based on registrations will increase over time, other things being equal.

Table 4 shows that for teeth filled (one of the common items of treatment), Pilots A and B experienced a reduction in treatment rates between 1997/98 and 2000/01 in contrast to increases experienced by the GDS comparators. Pilot C experienced a much larger reduction in the rate of teeth filled than its GDS comparator. The reductions in treatment rates for teeth filled were such that while in 1997/98 the dentists that subsequently went into the pilots experienced higher treatment rates than their local GDS colleagues, by 1999/00 the dentists in the PDS pilots lower treatments rates which were sustained in 2000/01.

Table 4 also illustrates the very wide variation in treatment rates between pilots/health authorities. For example, in 2000/01 for rate for teeth filled varied from 58 per 100 adult registrations in Pilot A to 318 per 100 adult registrations for the GDS dentists in Pilot C's health authority.

Scaling was another common item of treatment and table 4 shows that all three pilots experienced a reduction in treatment rates between 1997/98 and 2000/01 in contrast to increases experienced by the GDS comparators.

The three pilots also share a trend of smaller reductions or little change in rates for the three other items of treatment shown in table 4 (teeth extracted, teeth inlayed or crowned, teeth root filled) between 1997/98 and 2000/01.

[9] Pilot D is excluded from this table because it adopted a two year registration period, which means that its treatment rates are not comparable to those of the other pilots.

[10] The 1997/98 comparator data excludes the GDS activity for those dentists who subsequently went into the PDS pilots.

Table 4: item of treatment rates per 100 adult registrations

	number of items of treatment in 2000/01		item of treatment rate per 100 adult registrations						change in rate between 1997/98 and 2000/01		difference in change in rate between pilot and comparator	
			pilot			GDS HA comparator						
	pilot	comparator	97/98	99/00	00/01	97/98	99/00	00/01	pilot	comparator		
Pilot A												
teeth filled	16,830	179,667	81	61	58	71	76	73	-23.1	2.0	-25.2	*
scaling	19,605	208,415	70	72	67	76	87	85	-3.2	8.8	-12.0	*
teeth extracted	3,805	26,947	14	13	13	10	11	11	-1.0	0.6	-1.6	*
teeth inl. or cro.	1,758	20,213	6	4	3	5	6	6	-2.9	0.6	-3.5	*
teeth root filled	1,105	11,257	5	4	4	4	5	5	-1.3	0.5	-1.8	*
Pilot B												
teeth filled	11,296	112,133	75	64	67	66	73	73	-8.2	7.0	-15.2	*
scaling	9,863	130,932	64	51	59	76	84	85	-4.9	9.2	-14.1	*
teeth extracted	2,314	16,521	15	14	14	11	11	11	-1.4	0.2	-1.6	*
teeth inl. or cro.	821	11,693	6	5	5	6	8	8	-0.8	1.6	-2.3	*
teeth root filled	331	7,027	2	2	2	4	4	5	0.1	0.8	-0.7	*
Pilot C												
teeth filled	4,979	241,161	411	116	126	343	342	318	-285.1	-25.5	-259.5	*
scaling	4,615	135,363	179	110	117	169	180	178	-62.3	9.5	-71.8	*
teeth extracted	882	23,435	27	17	22	30	32	31	-4.3	1.0	-5.3	*
teeth inl. or cro.	1,094	26,483	35	26	28	31	34	35	-6.8	4.2	-11.0	*
teeth root filled	964	24,604	37	23	24	32	33	32	-12.6	0.7	-13.2	*

* $p<0.05$

Table 5 replicates table 4 for the two most common items of treatment for children. Pilot A experienced a reduction in the rate of teeth filled from 80 per 100 child registrations in 1997/98 (pre-pilot) to 52 per 100 child registrations in 2000/01. In contrast, Pilot C experienced a small increase in rate.

Table 5: item of treatment rates per 100 child registrations

	number of items of treatment in 2000/01		item of treatment rate per 100 child registrations						change in rate between 1997/98 and 2000/01		difference in change in rate between pilot and comparator	
			pilot			GDS HA comparator						
	pilot	comparator	97/98	99/00	00/01	97/98	99/00	00/01	pilot	comparator		
Pilot A												
teeth filled	5,715	60,179	80	45	52	60	67	62	-27.5	2.6	-30.1	*
teeth extracted	1,415	13,185	15	13	13	14	14	14	-2.0	0.2	-2.1	*
Pilot C												
teeth filled	1,936	74,559	16	16	19	30	35	34	3.1	3.8	-0.7	
teeth extracted	300	14,054	2	4	3	6	7	6	0.6	0.8	-0.2	

* $p<0.05$

The pilot-level summaries shown in tables 3 to 5 provide a picture of overall changes in the provision of dental services associated with the capitation-based pilots. However, the pilots are subject to considerable variation in the detail of the capitation funding arrangements and the payment methods for participating dentists. For example, in Pilot A, while each of the practice owners were funded on the basis of the capitation payments outlined above, the associate dentists working in the pilot were paid on the basis of their activity and the GDS fee structure. For this reason, the associate dentists did not share the same financial incentives as the lead 'provider' dentists. As expected the 'provider' dentists experienced lower treatment rates than their associates[11]. This comparison is simplistic, however, as it may be that associate dentists see a higher proportion of 'new' patients (requiring comparatively high levels of treatment) than the provider dentists with their established patient lists[12].

The cost of the capitation-based PDS pilots

Estimates of the cost of the capitation-based PDS pilots are problematic, as the cost data supplied by the DPB and the cost data presented in the pilots' annual reports do not readily reconcile (table 6). The total costs for Pilots A and B in 2000/01 recorded by the DPB were lower than those shown in the pilots' annual reports (15% and 17% respectively). The total cost for Pilot C in 2000/01 recorded by the DPB was 9% higher than that shown in the pilot's annual report. The DPB provided estimates of what the PDS activity in 2000/01 would have cost if it had been funded under the GDS regulation

[11] In 2000/01, for example, the 'provider' dentists in Pilot A experienced a rate of 34 per 100 adult registrations for teeth filled, compared to a rate of 87 per 100 adult registrations experienced by the associate dentists.

[12] The associates in Pilot B were funded on a capitation basis, and experienced higher treatment rates than their 'provider' colleagues. However, the first course of treatment attracted fees per item of service, and this may account for the difference in rates assuming that the associates treated a higher proportion of 'new' patients.

fees, which range from 7% less than the DPBs' actual cost for Pilot A to 18% less than the DPBs' actual cost for Pilot C. Table 6 also shows the relevant regional mean cost of GDS activity per registration.

Table 6 2000/01 cost data for three of the capitation-based pilots

pilot	Average number of registered patients	Actual cost (DPB data)	Actual cost (Pilots' annual reports)	Estimated cost under GDS regulations (DPB data)	cost per average registration			
					DPB cost data	Annual report cost data	cost estimated under GDS regs[1]	GDS comparator (regional mean cost)[1]
A	40,140	1,815,651	2,095,987	1,682,796	45.23	52.22	41.92	56.41
B	16,883	867,233	1,015,057	735,888	51.37	60.12	43.59	57.45
C	13,974	924,438	841,818	757,564	66.15	60.24	54.21	76.55

These crude cost data suggest that the cost per registration under PDS is similar to the cost per registration under GDS. However, the reduction in item of treatment activity associated with the PDS pilots is such that the PDS pilots are associated with a comparatively higher cost in terms of items of treatment.

Discussion

Information Technology and management information

The use of IT to electronically transfer activity and cost data between the pilots and the DPB was a feature of the first wave pilots. For some pilots this represented an opportunity to gain additional funds to update software and hardware, while for others it entailed computerisation and a difficult learning curve. The collection of basic PDS activity data has been problematic. With hindsight, it is clear that the challenge associated with adapting the GDS data collection procedures was greater than initially anticipated. The capitation-based pilots' dependence on increasing registrations to secure growth funding meant that effort was expended to resolve discrepancies between data generated by the pilots and data processed by the DPB[13].

With hindsight data management issues would have benefited from more effective communication between the pilots, health authorities, the Department of Health and DPB. The DPB's task of adapting the GDS data management processes for the first wave PDS pilots was considerable not least because of the limited time available for preparation.

The impact of capitation funding on activity

The introduction of funding based on capitation was intended to bring about a change in treatment behaviour by breaking the direct 'treadmill' link between income and items of treatment provided. The absence of the incentives leading to the income maximising behaviour associated with the GDS regulations provided, in theory, a new opportunity for dentists to promote a less interventionist approach to dental care. In addition to a change in treatment patterns, capitation funding was also intended to facilitate dentists' efforts to promote better self-care amongst patients and find more efficient ways of maintaining

[13] In contrast, for some of the trust-led salary-based pilots the collection and analysis of activity data did not influence their income and so appeared to be assigned a comparatively low priority.

oral health through adoption of evidence based practice, particularly in situations where there is no evidence to support intervention or frequent surveillance.

The summary analysis presented here suggests that in general these pilots did experience a change in activity which is compatible with the opportunities provided by the new financial incentives. The change in the pattern of dental treatment provided and the arrangements for growth payment have contributed to the pilots' ability to treat additional patients. In some pilots this has resulted in reports of a substantial contribution to the Dental Action Plan through improvements in access to NHS dental care. For example, Pilot A was successful in terms of providing access to primary dental care such that complaints to the local health authority by members of the public unable to see an NHS dentist in the pilot's locality were reported to have ceased. The fact that this outcome was achieved with less than the expected increase in registrations highlights the extent to which registrations is an unsatisfactory denominator.

The move to a more preventive approach to dental care implies that the GDS regulations result in some unnecessary treatment. Similarly, dental care provided under capitation funding arrangements is open to the perverse incentive to under treat or withhold necessary treatment. One measure that provides some insight on this issue is the Dental Reference Service patient examinations. Although the number of examined patients from the pilots is small, the Dental Reference Service activity has not identified any systematic problems. It may still too early to assess the potential consequences of any over-zealous embracing of a watch and wait philosophy. Nevertheless, one PDS pilot lead dentist emphasised that the Dental Reference Service is able to detect under treatment, because a hole that should have been filled is visible. "On the other side of the coin, you can't demonstrate over prescription, because you can see a tooth that has got a filling in, but you don't know whether it had a hole that needed it. So you are not comparing like with like. Whilst all my patients are there and the evidence is there, the corresponding evidence for over prescription is not available."

A further concern is the potential increase in the incentive for a PDS dentist to promote private dental treatment compared to a dentist offering NHS care under the GDS regulations. Private practice activity remains outside the realm of routine data. However, the Health Authority lead for one of the capitation-based pilots reported that the randomly chosen inspection of 20 patients' notes during each quarterly visit to practices had not indicated any change in the level of recorded private practice activity.

Local contracts for primary dental care

In general the capitation-based pilots have been managed through informal contact between the health authority and pilot leads, based on a high level of mutual trust. The contracts are simplistic. A number of the more proactive health authority and pilot leads have started to develop more sophisticated contracting arrangements which begin to provide a framework for performance management appropriate for organisations as they move beyond pioneer first wave pilot status. Many of the issues are shared by the first wave Personal Medical Services (PMS) pilots (Walsh et al, 2002). Arrangements for monitoring activity and cost need to improve in order to better manage dentist workload

when, for example, dentists join or leave a pilot. Nevertheless, the local contracts have provided a framework in which health authorities and dentists have started to address quality issues, which has great potential when compared with the GDS arrangements. The development of dental expertise within Strategic Health Authorities and Primary Care Trusts is now a key challenge in order to secure effective leadership in the future. The health authority leads for these pilots were commonly Consultants in Dental Public Health operating with little support.

Different reasons have been reported for dentists leaving a pilot. Some departures are not necessarily related to the operation of the pilot (eg leaving after a period of maternity leave) while others illustrate issues that need to be addressed if capitation-based funding is to be extended. For example, one dentist was reported to have left a pilot because they were seeing a high proportion of high-need patients requiring treatment at a level that made the capitation funding financially unattractive. Another dentist was reported to have left a pilot because they were "not working towards the scheme's objectives". The health authority lead reported that this dentist would not have met recently introduced acceptance criteria for dentists wishing to join the pilot, and so illustrates the greater potential of the pilots to influence practice compared to GDS.

The variation in funding arrangements and characteristics between the pilots, combined with the short-term coverage of the evaluation, make it difficult to determine the 'ideal' capitation model at this stage. The pilots could undoubtedly learn from each other and the absence of initiatives by the Department of Health to promote 'collaborative' learning is a feature of PDS (and PMS), in contrast to other major pilot programmes (Ham et al, 2002). Nevertheless, the pilots suggest that capitation-based funding offers a viable alternative to GDS provision.

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