Effect of financial incentives on inequalities in the delivery of primary clinical care in England: analysis of clinical activity indicators for the quality and outcomes framework

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Summary

Background **The quality and outcomes framework is a financial incentive scheme that remunerates general practices in the UK for their performance against a set of quality indicators. Incentive schemes can increase inequalities in the delivery of care if practices in affluent areas are more able to respond to the incentives than are those in deprived areas. We examined the relation between socioeconomic inequalities and delivered quality of clinical care in the first 3 years of this scheme.**

Methods **We analysed data extracted automatically from clinical computing systems for 7637 general practices in England, data from the UK census, and data for characteristics of practices and patients from the 2006 general medical statistics database. Practices were grouped into equal-sized quintiles on the basis of area deprivation in their locality. We calculated overall levels of achievement, defined as the proportion of patients who were deemed eligible by the practices for whom the targets were achieved, for 48 clinical activity indicators during the first 3 years of the incentive scheme (from 2004–05 to 2006–07).**

Findings **Median overall reported achievement was 85·1% (IQR 79·0–89·1) in year 1, 89·3% (86·0–91·5) in year 2, and 90·8% (88·5–92·6) in year 3. In year 1, area deprivation was associated with lower levels of achievement, with median achievement ranging from 86·8% (82·2–89·6) for quintile 1 (least deprived) to 82·8% (75·2–87·8) for quintile 5 (most deprived). Between years 1 and 3, median achievement increased by 4·4% for quintile 1 and by 7·6% for quintile 5, and the gap in median achievement narrowed from 4·0% to 0·8% during this period. Increase in achievement during this time was inversely associated with practice performance in previous years ($p<0·0001$), but was not associated with area deprivation ($p=0·062$).**

Interpretation **Our results suggest that financial incentive schemes have the potential to make a substantial contribution to the reduction of inequalities in the delivery of clinical care related to area deprivation.**

Funding **None.**

Introduction

In 1997, the UK Government made an explicit commitment to tackle health inequalities, and has since pursued several social and health policies to this end.[1–3] The National Health Service (NHS) was targeted with an ambitious programme of initiatives to improve quality that aimed to eliminate unacceptable variations in the standard of health care.[3,4] The UK Government reiterated its original commitment by making health inequalities a health-service priority for 2008–09, with the specific objective of improving life expectancy in areas with the worst health and deprivation. Primary-care services are intended to have a central role in achieving this objective.[5]

The most substantial UK Government intervention in primary care was the re-negotiation of the national contract with general practitioners in 2003. At the core of the new contract was the quality and outcomes framework, which links financial incentives to the quality of care that is provided by practices.[6] Quality is measured against a set of clinical activity indicators relating to aspects of care for several common chronic diseases, with practices rewarded according to the proportion of eligible patients for whom each target is achieved. Further payments are awarded for aspects of practice organisation and for administering patient surveys. To protect patients from inappropriate care, the scheme allows practices to exclude patients who they deem inappropriate from specific indicators, for reasons such as extreme frailty, intolerance of a particular drug, and declining treatment.[7]

In the first full year of the scheme (2004–05), practices generally reported high levels of achievement for the clinical indicators,[8] and levels of achievement have, on average, increased every year for most indicators.[9] However, there are concerns that practices serving deprived populations have achieved lower levels of performance,[10] have received less generous financial rewards,[11] and might have excluded more patients than have those serving more affluent populations.[12] If this tenet is true, the incentive scheme could be driving an overall increase in quality of care at the cost of widening existing health inequalities, and hence undermining Government policy.

The early years of public-health interventions are often damaging in terms of health equity.[13–16] Victora and colleagues' inverse equity hypothesis[17] proposes that

affluent sections of society preferentially benefit from, or exploit, such interventions, leading to an initial increase in inequalities, and deprived sections only begin to catch up once affluent sections of society have extracted maximum benefit. Health inequalities ultimately diminish because people in deprived areas start with a lower baseline level of health and health-care uptake.

We aimed to examine the pattern of socioeconomic inequalities with respect to delivered quality of clinical care in the first 3 years of the incentive scheme in England and to changes in quality of clinical care during this time. We examined both patterns in achievement against the clinical quality indicators and in the number of patients who were excluded from the scheme by practices.

	Indicator*	Points†		Payment range‡	
		Years 1–2	Year 3	Years 1–2	Year 3
Asthma					
ASTHMA 2 (8)	Diagnosis confirmed by spirometry or peak flow measurement (ages ≥8 years)	0–15	0–15	25–70%	40–80%
ASTHMA 3	Smoking status recorded (ages 14–19 years)	0–6	0–6	25–70%	40–80%
ASTHMA 6	Have had an asthma review	0–20	0–20	25–70%	40–70%
Cancer					
CANCER 2	Reviewed in practice (newly diagnosed patients)	0–6	0–6	25–90%	40–90%
Coronary heart disease					
CHD 2	Referred for exercise testing and/or specialist assessment	0–7	0–7	25–90%	40–90%
CHD 5	Blood pressure recorded	0–7	0–7	25–90%	40–90%
CHD 6	Blood pressure 150/90 mm Hg or less	0–19	0–19	25–70%	40–70%
CHD 7	Total cholesterol recorded	0–7	0–7	25–90%	40–90%
CHD 8	Total cholesterol 5 mmol/L (193 mg/dL) or less	0–16	0–17	25–60%	40–70%
CHD 9	Taking aspirin or alternative antiplatelet/anticoagulant	0–7	0–7	25–90%	40–90%
CHD 10	Taking β blocker	0–7	0–7	25–50%	40–60%
CHD 11	Taking ACE inhibitor (history of myocardial infarction)	0–7	0–7	25–70%	40–80%
CHD 12	Received influenza vaccination	0–7	0–7	25–85%	40–90%
Heart failure					
LVD 2 (HF 2)	Diagnosis confirmed by echocardiogram	0–6	0–6	25–90%	40–90%
LVD 3 (HF 3)	Taking ACE inhibitors or A2 antagonists	0–10	0–10	25–70%	40–80%
Chronic obstructive airways disease					
COPD 3 (9)	Spirometry and reversibility testing (all patients)	0–5	0–10	25–90%	40–80%
COPD 8	Received influenza immunisation	0–6	0–6	25–85%	40–85%
Diabetes mellitus					
DIABETES 2	BMI recorded	0–3	0–3	25–90%	40–90%
DIABETES 5	Haemoglobin A_{1c} recorded	0–3	0–3	25–90%	40–90%
DIABETES 6 (20)	Haemoglobin A_{1c} 7·4% (7·5% in year 3) or less	0–16	0–17	25–50%	40–50%
DIABETES 7	Haemoglobin A_{1c} 10% or less	0–11	0–11	25–85%	40–90%
DIABETES 8 (21)	Retinal screening recorded	0–5	0–5	25–90%	40–90%
DIABETES 9	Peripheral pulses recorded	0–3	0–3	25–90%	40–90%
DIABETES 10	Neuropathy testing recorded	0–3	0–3	25–90%	40–90%
DIABETES 11	Blood pressure recorded	0–3	0–3	25–90%	40–90%
DIABETES 12	Blood pressure 145/85 mm Hg or less	0–17	0–18	25–55%	40–60%
DIABETES 13	Microalbuminuria testing recorded	0–3	0–3	25–90%	40–90%
DIABETES 14 (22)	Serum creatinine recorded	0–3	0–3	25–90%	40–90%
DIABETES 15	Taking ACE inhibitors/A2 antagonists (proteinuria or microalbuminuria)	0–3	0–3	25–70%	40–80%
DIABETES 16	Total cholesterol recorded	0–3	0–3	25–90%	40–90%
DIABETES 17	Total cholesterol 5 mmol/L (193 mg/dL) or less	0–6	0–6	25–60%	40–70%
DIABETES 18	Received influenza immunisation	0–3	0–3	25–85%	40–85%
Epilepsy					
EPILEPSY 2 (6)	Seizure frequency recorded (ages ≥16 years)	0–4	0–4	25–90%	40–90%
EPILEPSY 3 (7)	Medication reviewed (ages ≥16 years)	0–4	0–4	25–90%	40–90%
EPILEPSY 4 (8)	Convulsion-free for 12 months (ages ≥16 years)	0–6	0–6	25–70%	40–70%

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	Indicator*	Points†		Payment range‡	
		Years 1–2	Year 3	Years 1–2	Year 3
(Continued from previous page)					
Hypertension					
BP 4	Blood pressure recorded	0–20	0–20	25–90%	40–90%
BP 5	Blood pressure 150/90 mm Hg or less	0–56	0–57	25–70%	40–70%
Hypothyroidism					
HYPOTHYROID 2	Thyroid function tests recorded	0–6	0–6	25–90%	40–90%
Severe mental health					
MH 2 (9)	Reviewed in practice	0–23	0–23	25–90%	40–90%
MH 4	Serum creatinine and TSH recorded (on lithium therapy)	0–3	0–1	25–90%	40–90%
MH 5	Lithium concentrations in the therapeutic range (on lithium therapy)	0–5	0–2	25–70%	40–90%
Stroke					
STROKE 2 (11)	Referred for CT or MRI scan	0–2	0–2	25–80%	40–80%
STROKE 5	Blood pressure recorded	0–2	0–2	25–90%	40–90%
STROKE 6	Blood pressure 150/90 mm Hg or less	0–5	0–5	25–70%	40–70%
STROKE 7	Total cholesterol recorded	0–2	0–2	25–90%	40–90%
STROKE 8	Total cholesterol 5 mmol/L (193 mg/dL) or less	0–5	0–5	25–60%	40–60%
STROKE 9 (12)	Taking aspirin, or alternative antiplatelet/anticoagulant (non–haemorrhagic)	0–4	0–4	25–90%	40–90%
STROKE 10	Received influenza immunisation	0–2	0–2	25–85%	40–85%

ACE=angiotensin-converting enzyme. BMI=body-mass index. TSH=thyroid-stimulating hormone. *Some indicator codes changed in year 3. Updated codes are given in parentheses. †Number of points that can be awarded for the indicator. Each point earned the average practice £76 in year 1 (2004–05) and £126 in years 2 (2005–06) and 3 (2006–07). Total points for all indicators was 392 in years 1 and 2, and 396 in year 3. ‡Points are awarded on a sliding scale within the stated range—eg, for ASTHMA 6 in years 1 and 2, the practice must have reviewed at least 25% of asthma patients to earn any points, and must have reviewed 70% or more to have earned the maximum 20 points.

Table 1: **Codes for the clinical activity indicators on the quality and outcomes framework included in the study**

Methods

The quality and outcomes framework

General practices in England provide primary-care services for a defined population (mean 6226 [SD 3869] patients). For the clinical indicators on the quality and outcomes framework, practices are awarded points on a sliding scale on the basis of the proportion of eligible patients for whom they achieve every target. The minimum achievement threshold is 25% (ie, practices must achieve the target for at least 25% of patients to receive any points) and the maximum threshold varies according to the indicator (table 1). The maximum number of points awarded also varies by indicator. In year 1 (2004–05), each point earned the practice GB£76, with adjustment for the relative prevalence of the disease and the size of the practice population. This sum was increased to £126 for years 2 and 3 (2005–06 and 2006–07). The clinical indicators were revised for year 3, with minimum achievement thresholds raised to 40% and maximum thresholds raised for some indicators. Furthermore, 17 new indicators were introduced, 32 existing indicators were combined or revised, and three were dropped. Our analyses relate to the 34 clinical activity indicators that remained substantially unchanged and a further 14 that underwent only minor revisions (table 1).

Data gathering

We derived data for practice performance on the clinical indicators from the quality management and analysis system, which is operated by the NHS information centre. This system automatically extracts data from practices' clinical computing systems, including the number of patients deemed appropriate for every indicator—ie, those who were in the subgroup specified by the indicator and were not excluded by the practice (D_i), and the number for whom the indicator was met (N_i). Since year 2, extracted data have also included the number of patients who were excluded by the practice (E_i).

See Online for webappendix

Statistical analysis

We calculated practices' reported achievement for every indicator in each year as N_i/D_i. A summary outcome score for each practices' overall achievement on the clinical indicators was constructed as an unweighted mean of the scores for every indicator. This method prevented highly prevalent indicators from dominating and kept the differences arising from heterogeneous practice populations to a minimum.[18] Because there might be socioeconomic patterns to account for the exclusion of patients that would affect patterns for reported achievement, we also analysed rates of exclusion for years 2 and 3, which were calculated as $E_i/(D_i+E_i)$. We calculated summary outcome scores as for reported achievement. The distributions of both outcome scores were highly skewed and were therefore summarised with medians and IQR; however, the very large sample size justified the use of parametric methods for inferential testing.[19] We confirmed the resulting p values by means of bootstrapping (webappendix).

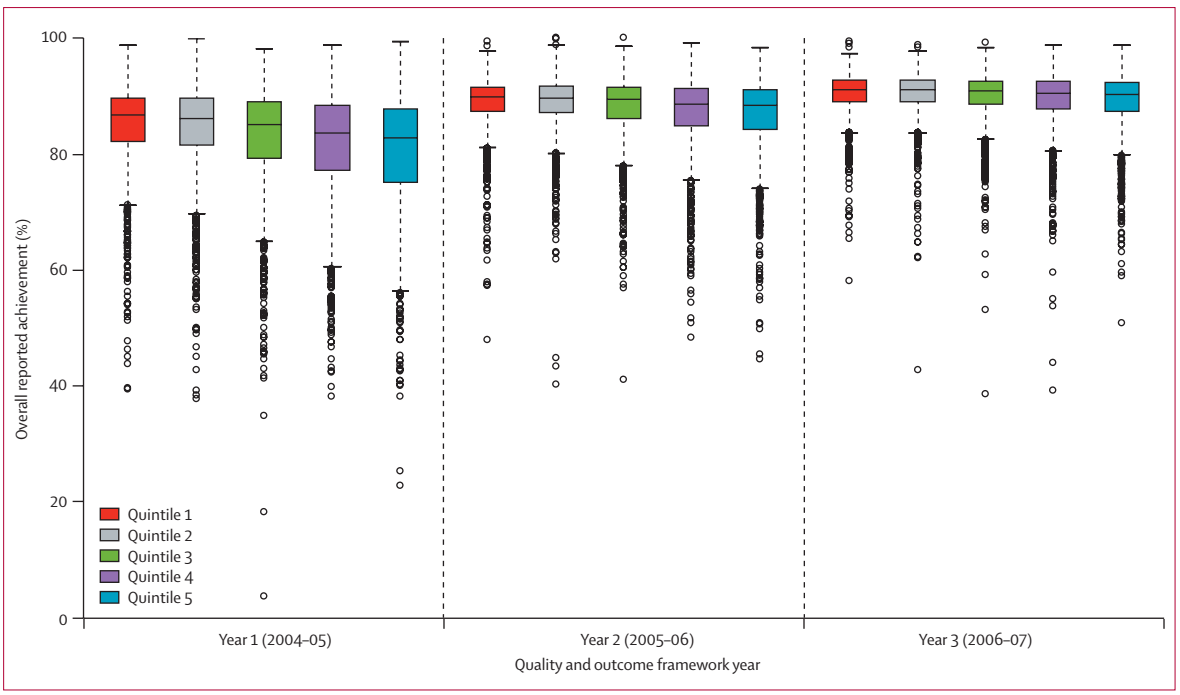

Figure 1: **Distribution of scores for overall reported achievement by deprivation quintile for year 1 (2004–05) to year 3 (2006–07)**
Central line shows median achievement and box shows interquartile range; whiskers represent range of achievement scores. Circles represent statistical outliers—ie, individual practices with achievement scores outside the range: first quartile–(1·5×IQR) to third quartile+(1·5×IQR).

Information about practice and patient characteristics was taken from the 2006 general medical statistics database, which is maintained by the Department of Health. Practices were grouped into quintiles of equal size on the basis of the level of area deprivation in the census super-output area (a standard, stable unit of geography used in the UK for statistical analysis; average population 7200) where they were located, with data from the Index of Deprivation 2004.[20] We calculated the odds of practices from each quintile being in the top and bottom performing 5% of practices with respect to achievement and rates of exclusion by logistic regression. We estimated the associations of practice-level characteristics with practice achievement, exclusion of patients, and changes in these outcomes with multiple linear regressions. These analyses controlled for missing indicators, heterogeneity of variance, and clustering of practices, and we made checks on the robustness of the results to model specifications (webappendix). All variables were divided by their standard deviations, thus regression coefficients show the increase in standard deviations of the outcome for one standard deviation increase in predictor variables. All statistical analyses were done with Stata software (version 9).

Achievement data for 2004–05, 2005–06, and 2006–07 were available for 8277 general practices in England. Practices were excluded from the study if they had fewer than 1000 patients in any 1 year (49 practices), one or more disease registers were missing (47 practices), the practice relocated to a more or less affluent area during the period (164 practices), complete exclusion data were not available (172 practices), or if the practice population changed in size by 25% or more (258 practices). Our main results are drawn from 7637 practices, providing care for more than 49 million patients. We undertook subanalyses for excluded practices (webappendix).

Role of the funding source

There was no funding source for this study. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

The median overall reported achievement—the proportion of patients who were deemed eligible by the practices for whom the targets were achieved—was 85·1% (IQR 79·0–89·1) in year 1, 89·3% (86·0–91·5) in year 2, and 90·8% (88·5–92·6) in year 3. Increases in achievement between years were significant ($p<0·0001$ in all cases). Although average levels of achievement increased over time, variation in achievement diminished.

In year 1, progressively lower levels of achievement were associated with increased levels of area deprivation (figure 1). Median achievement ranged from 86·8% (IQR 82·2–89·6) for quintile 1 (least deprived) to 82·8% (75·2–87·8) for quintile 5 (most deprived), with variation in achievement between practices increasing with deprivation (figure 1).

Although median levels of reported achievement improved for all deprivation quintiles in years 2 and 3, practices from the more deprived quintiles generally improved at the fastest rates (figure 1). Between years 1 and 3, median achievement increased by 4·4% for quintile 1 and by 7·6% for quintile 5, with the gap in median achievement between practices from these quintiles narrowing from 4·0% in year 1 to 1·5% in year 2 and then to 0·8% in year 3. Variation in reported achievement also decreased at a faster rate for practices in the most deprived areas (figure 1). These patterns of increasing median achievement and decreasing variation in achievement over time were consistent across all 48 individual indicators.

In all 3 years, the highest performing 5% of practices were distributed quite evenly across the five deprivation quintiles (table 2). Quintiles 4 and 5 tended to have fewer of the best-performing practices, but differences were not statistically significant. By contrast, the more deprived the quintile, the more of the poorest performing 5% of practices it contained. In every year, three to four times as many of the poorly performing practices came from quintile 5 than from quintile 1 (table 2).

	Best performing 5% of practices			Worst performing 5% of practices		
	Number of practices	Percentage of practices*	Odds ratio (95% CI)†	Number of practices	Percentage of practices*	Odds ratio (95% CI)†
Overall reported achievement						
Year 1						
Quintile 1	79	5·17%		36	2·36%	
Quintile 2	84	5·50%	1·07 (0·78–1·46)	48	3·14%	1·34 (0·87–2·08)
Quintile 3	77	5·04%	0·97 (0·71–1·34)	69	4·52%	1·96 (1·30–2·95)‡
Quintile 4	74	4·84%	0·93 (0·67–1·29)	97	6·35%	2·81 (1·90–4·15)‡
Quintile 5	67	4·39%	0·84 (0·60–1·18)	131	8·58%	3·89 (2·67–5·67)‡
Year 2						
Quintile 1	73	4·78%		35	2·29%	
Quintile 2	77	5·04%	1·06 (0·76–1·47)	48	3·14%	1·38 (0·89–2·15)
Quintile 3	84	5·50%	1·16 (0·84–1·60)	65	4·26%	1·90 (1·25–2·88)‡
Quintile 4	68	4·45%	0·93 (0·66–1·30)	96	6·28%	2·86 (1·93–4·24)‡
Quintile 5	79	5·18%	1·09 (0·79–1·51)	137	8·98%	4·21 (2·88–6·14)‡
Year 3						
Quintile 1	76	4·97%		38	2·49%	
Quintile 2	81	5·30%	1·07 (0·78–1·47)	43	2·81%	1·14 (0·73–1·77)
Quintile 3	83	5·44%	1·10 (0·80–1·51)	74	4·85%	2·00 (1·34–2·97)‡
Quintile 4	76	4·97%	1·00 (0·72–1·39)	106	6·94%	2·92 (2·00–4·26)‡
Quintile 5	65	4·26%	0·85 (0·61–1·19)	120	7·86%	3·35 (2·31–4·85)‡
Overall exclusion rate						
Year 2						
Quintile 1	53	3·47%		62	4·06%	
Quintile 2	48	3·14%	0·90 (0·61–1·34)	77	5·04%	1·25 (0·89–1·77)
Quintile 3	90	5·89%	1·74 (1·23–2·47)‡	85	5·57%	1·39 (1·00–1·95)
Quintile 4	100	6·54%	1·95 (1·39–2·74)‡	74	4·84%	1·20 (0·85–1·70)
Quintile 5	90	5·90%	1·74 (1·23–2·47)‡	83	5·44%	1·36 (0·97–1·90)
Year 3						
Quintile 1	59	3·86%		61	3·99%	
Quintile 2	48	3·14%	0·81 (0·55–1·19)	70	4·58%	1·15 (0·81–1·64)
Quintile 3	71	4·65%	1·21 (0·85–1·73)	91	5·96%	1·52 (1·09–2·12)
Quintile 4	98	6·41%	1·71 (1·23–2·38)‡	75	4·91%	1·24 (0·88–1·75)
Quintile 5	105	6·88%	1·84 (1·33–2·55)‡	84	5·50%	1·40 (1·00–1·96)

For the worst performing 5% of practices for overall reported achievement and for the best performing 5% of practices for overall exclusion rate, the associations between deprivation quintile and the outcomes were significant ($p<0·05$) in every year. *Percentage of all practices from this quintile that appear in the best/worst performing 5% of practices. †Ratio of the odds of a practice from this quintile appearing in the relevant group (eg, best 5% of practices for overall reported achievement) to the odds for practices from quintile 1 appearing in the group. ‡Odds significantly different ($p<0·05$) from those for quintile 1, where there is also an association between deprivation quintile and outcome.

Table 2: **Best and worst performing 5% of practices for reported overall achievement and exclusion rates from each deprivation quintile from year 1 (2004–05) to year 3 (2006–07)**

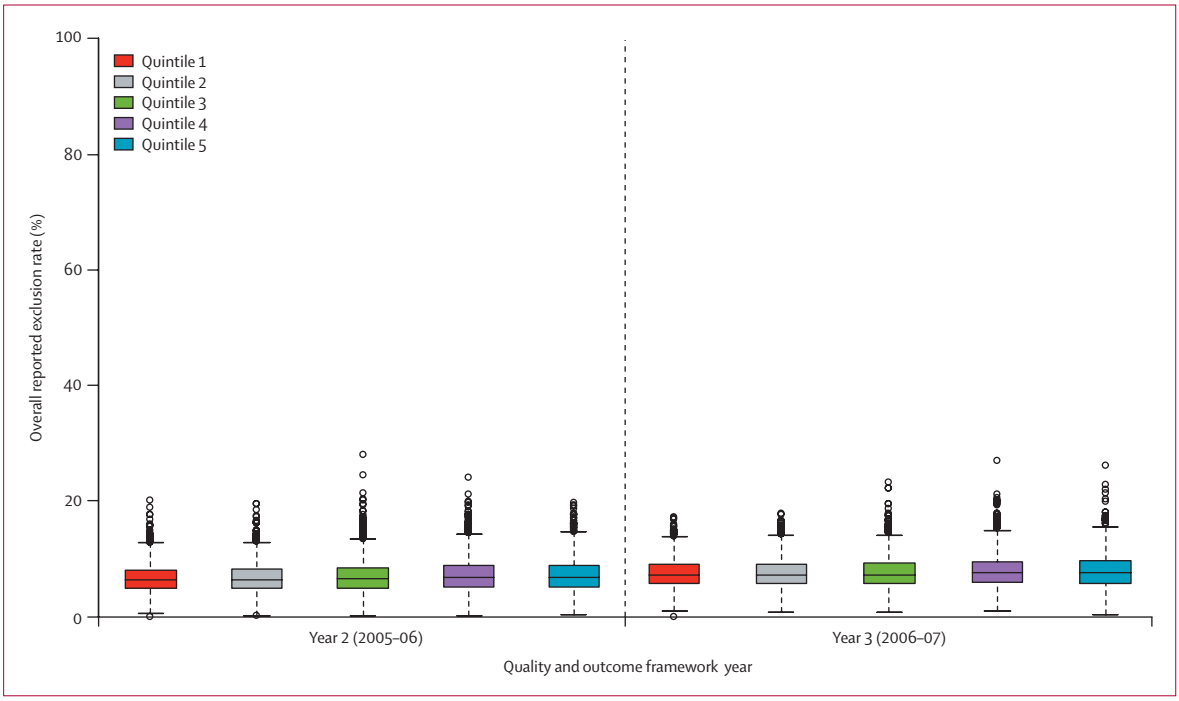

Figure 2: **Distribution of scores for overall exclusion rate by deprivation quintile for year 2 (2005–06) to year 3 (2006–07)**
Central line shows median exclusion rate and box shows interquartile range; whiskers represent range of exclusion rates. Circles represent statistical outliers—ie, individual practices with exclusion rates outside the range: first quartile–(1·5×IQR) to third quartile+(1·5×IQR).

Overall, practices excluded a median 6·57% (IQR 5·03–8·45) of patients in year 2, with generally little variation in rates between practices (figure 2). Greater deprivation was associated with marginally higher exclusion rates (ranging from 6·29% [4·98–8·12] for quintile 1 to 6·80% [5·03–8·89] for quintile 5) and variation in rates. In year 3, the median rate increased to 7·40% (5·79–9·30). Median rates ranged from 7·21% (5·79–9·04) for quintile 1 to 7·59% (5·77–9·69) for quintile 5. 113 (1·5%) practices excluded more than 15% of patients in year 2 and 128 (1·7%) did in year 3.

In both years, almost twice as many of the 5% of practices with the highest exclusion rates came from quintile 5 than from quintile 1 (table 2). By contrast, the

	Deprivation quintile (range of area deprivation scores)*					
	1 (0·74–10·54)	2 (10·55–17·12)	3 (17·13–26·23)	4 (26·24–39·88)	5 (39·89–83·57)	All (0·74–83·57)
Area						
Population density (persons/hectare)	19·90 (22·22)	25·74 (25·08)	35·42 (29·67)	45·68 (34·06)	47·63 (33·61)	34·87 (31·23)
Patients						
Percentage ≤15 years of age	17·15% (3·09)	16·91% (3·23)	17·34% (3·29)	18·22% (4·08)	19·53% (4·46)	17·82% (3·79)
Percentage ≥65 years of age	16·47% (4·90)	16·55% (5·08)	15·58% (4·94)	14·12% (4·89)	13·43% (4·47)	15·24% (5·02)
Percentage of women	50·29% (1·84)	50·22% (2·17)	49·93% (2·36)	49·34% (2·72)	48·76% (2·90)	49·71% (2·50)
Percentage racial or ethnic minority	8·46% (9·45)	9·41% (12·44)	13·61% (17·27)	19·97% (22·43)	23·18% (23·74)	14·93% (18·84)
Practice						
Size of practice population	7314 (3949)	6784 (3854)	6558 (4027)	6051 (3725)	5382 (3366)	6418 (3847)
Number of GPs per 10 000 patients	5·04 (1·18)	5·08 (1·25)	4·90 (1·24)	4·79 (1·28)	4·79 (1·37)	4·92 (1·27)
Primary medical services contract (%)†	36·45%	41·62%	41·98%	43·91%	47·31%	42·25%
General practitioners						
Percentage >50 years of age	34·12% (32·70)	37·18% (34·59)	42·78% (37·42)	50·99% (40·64)	54·63% (41·22)	43·90% (38·25)
Percentage of women	37·18% (25·05)	33·56% (26·16)	32·05% (28·60)	29·88% (29·96)	27·21% (30·69)	31·99% (28·36)
Percentage medically educated in UK	86·26% (27·53)	80·92% (33·00)	72·77% (38·11)	61·08% (42·88)	55·92% (43·89)	71·45% (39·27)

Data are mean (SD) unless otherwise stated. GP=general practitioner. *As measured by the Index of Deprivation 2004. †Proportion of practices from each quintile with a primary medical service contract.

Table 3: **Distribution of population and practice characteristics for general practices in England by deprivation quintile for year 1 (2004–05)**

5% of practices with the lowest exclusion rates were fairly evenly distributed across the deprivation quintiles, although quintile 1 tended to have fewer practices with very low exclusion rates than did quintile 5 (table 2).

The relation between area deprivation and practice achievement might be explained by other characteristics of practices or practice populations that are associated with deprivation (table 3). When we included such characteristics in regression analyses, area deprivation scores were significantly associated with reported achievement in all 3 years (table 4). However, the association was very modest; in year 1, the practice serving the most deprived population had a modelled level of reported achievement that was 4·60% lower than that serving the least deprived population. This difference in the level of achievement dropped to 1·94% in year 2 and 1·21% in year 3. All other significant associations were also small. The characteristic with the strongest association with achievement was the exclusion rate: a 1% higher rate of exclusions was associated with a 0·35% higher rate of achievement in year 2 and a 0·16% higher rate in year 3.

The association between area deprivation and reported exclusion rates remained significant after regression analysis (table 4), with practices serving the most deprived population having a modelled exclusion rate that was 0·55% higher than did those serving the least deprived population in year 2 and 0·67% higher in year 3. All other significant associations were small (table 4).

In the regression models, increase in achievement over time was not significantly associated with area deprivation but was very strongly associated with previous practice performance: the lower the achievement in the previous year, the greater the increase in achievement (table 4). Generally, more rapid improvement in achievement recorded for practices in more deprived quintiles was therefore attributable to their poorer initial performance, and not their location in deprived areas per se. We also noted an association with change in exclusion rates: a 1% increase in exclusion rate between years 2 and 3 was

	Outcome					Change in outcome*		
	Overall reported achievement			Overall reported exclusion rate		Overall reported achievement		Overall reported exclusion rate
	Year 1 (2004–05)	Year 2 (2005–06)	Year 3 (2006–07)	Year 2 (2005–06)	Year 3 (2006–07)	Years 1–2	Years 2–3	Years 2–3
Area								
Area deprivation†	−0·10 ‡	−0·07‡	−0·05‡	0·04§	0·05§	0·01	−0·00	0·03
Population density (people/hectare)	−0·04 §	−0·07‡	−0·06‡	0·06‡	0·08‡	−0·04‡	−0·01	0·05‡
Patients								
Percentage ≤15 years of age	−0·01	−0·03	−0·03	−0·05§	−0·06‡	−0·01	−0·01	−0·03
Percentage ≥65 years of age	−0·05‡	−0·04§	−0·05‡	−0·07‡	−0·08‡	−0·01	−0·02	−0·03§
Percentage of women	0·02	0·03	0·03	0·07‡	0·07‡	0·01	0·01	0·03
Percentage racial or ethnic minority	−0·02	−0·04	−0·06§	0·04	−0·01	−0·01	−0·03§	−0·05§
Practice								
Size of practice population	−0·05‡	−0·07 ‡	−0·09‡	0·03§	0·05‡	−0·03‡	−0·04‡	0·04‡
Number of GPs per 10 000 patients	0·08‡	0·03	0·04‡	−0·00	0·03	−0·02§	−0·01	0·02
Primary medical services contract¶	−0·04‡	−0·02	−0·01	0·02	0·02	0·02‡	0·01	0·01
General practitioners								
Percentage >50 or >55 years of age‖	−0·04‡	−0·07‡	−0·04§	0·03	−0·00	0·00	0·01	−0·01
Percentage of women	0·04‡	0·05‡	0·03§	0·00	−0·01	0·02	0·02§	0·00
Percentage medically educated in UK	0·10‡	0·08‡	0·05§	0·01	0·01	0·01	0·00	0·03
Exclusion rate								
Exclusion rate**	..	0·17‡	0·10‡	..	..	..	0·04‡	..
Change in exclusion rate††	..	..	..	..	..	..	0·23‡	..
Previous performance on quality and outcomes framework‡‡								
Score in reference year	..	..	..	..	..	−0·81‡	−0·56‡	−0·33‡

Data are standardised β coefficient. GP=general practitioner. *Change in value of the given outcome over the stated period. †Index of Deprivation 2004 score for the location of each practice (actual score, not quintile). ‡The regression coefficient is significant at p<0·01. §The regression coefficient is significant at p<0·05. ¶Practice has a primary medical service contract. ‖The age bands used on the Department of Health database changed in 2005, therefore for year 1 the figure is 50 years of age, and for years 2 and 3 it is 55 years of age. **Exclusion rate for the relevant year was included as explanatory variable for reported achievement in years 2 and 3. β coefficients for other explanatory variables did not change substantially on dropping exclusion rate from the models. ††Change in exclusion rate between years 2 and 3 was included as an explanatory variable for change in reported achievement over the same period. ‡‡Previous performance was included as a predictor in the regression analyses for change in outcome. Reference year was year 1 for change between years 1 and 2, and year 2 for change between years 2 and 3.

Table 4: **Regression analyses for the association of area, patient, and practice characteristics with outcomes (reported achievement and exclusion rate) and change in outcomes**

associated with a concurrent 0·42% increase in achievement. Increases in exclusion rates in year 3 were associated with lower rates in year 2, but were not significantly associated with area deprivation (table 4).

Discussion

Our study has shown that variation in the quality of care related to deprivation was reduced during the first 3 years of the financial incentive scheme. The quality and outcomes framework was intended to improve the general quality of primary care and to eliminate variation between providers by resourcing and rewarding best practice.[21] In the first 3 years of the scheme, more than £2 billion additional funding was provided for primary-care services: information technology systems were rapidly updated; a major new database was created to gather data from practice clinical computer systems and to publicly report performance; additional administrative and nursing staff were recruited; the number of general practitioners increased by 12%[22] (although deprived areas are still without a sufficient number of doctors[10]); and the income of general practitioners increased substantially.[23] All practices were provided with the same clear set of quality targets, and were supported in meeting them. This study provides evidence of changes in health-care inequalities in England during this period of activity.

However, the available data imposed several limitations: data for exclusions were not available for year 1; only practices with stable populations and complete data collection were included; only fairly unchanged indicators could be analysed (although levels of remuneration and achievement thresholds changed even for these indicators); analyses were at the practice not the patient level, and since some indicators provided incentives for the same activity for patients with different conditions, comorbidity will have led to some patients being counted twice; deprivation was summarised at the level of super-output areas, which might contain neighbourhoods with different levels of deprivation; and deprivation scores were assigned on the basis of practice location, hence some practices could have been misallocated with respect to deprivation quintile since some patients live outside of the immediate locality.

Reported quality of care was generally very high in year 1, and increased during the following 2 years. The rate of increase diminished for most indicators, which might indicate practices exceeding the maximum payment thresholds or approaching the limits of what was practically achievable. We recorded a clear socioeconomic gradient in year 1, with progressively lower achievement, and greater variation in achievement, with increasing area deprivation. The gradient was not steep, however, and despite generally having more patients per physician and facing a greater burden of disease,[11] most practices in deprived areas reported high levels of achievement. By year 3 the socioeconomic gradient had almost disappeared, although the poorest performing practices remained concentrated in the most deprived areas. At this time, other factors—such as the patient population age and sex profile—had stronger associations with achievement than did area deprivation.

Without a pre-intervention baseline, whether inequalities increased in the first year of the incentive scheme is impossible to establish, but clearly they decreased in years 2 and 3. The incentive scheme might therefore have eluded the inverse equity trap[17] and produced an overall improvement in quality of care without increasing inequity. Indeed, the scheme could be a rare example of a truly equitable public-health intervention,[24] since improvements in quality achieved by practices were inversely proportional to baseline performance and were not associated with the level of deprivation in the surrounding area.

However, alternative explanations could exist. First, inequalities in health care might already have increased, as predicted by Victora and colleagues' inverse equity hypothesis, in response to initiatives for quality improvement that were in operation before the incentive scheme. Evidence suggests that quality for some aspects of care was already improving before 2004,[25] and could have been approaching its achievable limit in affluent areas, which would mean that the incentive scheme was introduced at a time when inequalities had already peaked. Second, the results assume consistent and accurate recording of activity by practices, which were given a financial incentive to report high levels of achievement. Improvements might have been simulated by over-reporting numerators—eg, by claiming a missed target had been achieved—or by under-reporting denominators—eg, by inappropriately excluding difficult patients or excluding them from disease registers. We noted that increases in reported achievement between years 2 and 3 were associated with concurrent increases in exclusion rates, some of which might have been inappropriate, and in previous studies some practices that performed poorly in year 1 included fewer patients than expected on their chronic disease registers in year 2.[26] Third, the activities we assessed were mainly concerned with secondary prevention in people with existing chronic disease, and inequalities could have widened for activities that were not subject to an incentive, especially in practices that were devoting all their efforts to meeting the targets.

During the early years of the UK incentive scheme, variation in the quality of care provided by practices for activities with an incentive diminished, resulting in more equitable health care. Whether this will lead to a reduction in health inequalities is unknown, partly because of the cautions outlined above and partly because the root socioeconomic causes of the inequalities remain.[27–29] Nevertheless, quality of health-care provision is an important local agency factor for amelioration of existing health inequalities,[30,31] and interventions based on primary care, which are carefully integrated with

wider community-based programmes, have proved successful in reducing health inequalities for chronic disease.[32–34] More than 60% of the gap in life expectancy between the fifth of areas with the greatest material deprivation and poorest health in England and the rest of the country is attributable to diseases targeted in the incentive scheme, particularly coronary heart disease, cancer, and chronic obstructive airways disease.[5] Although the dangers of unintended consequences remain, generation of more equitable provision of prevention and care for these disorders means that the use of financial incentives seems to have the potential to make a substantial contribution to the reduction of health inequalities.

Contributors

TD, CF, EK, and DR participated in the planning of the study. Data were prepared by EK and interpreted and analysed by TD, CF, and DR. TD drafted the report, which was edited by CF, EK, DR, and TD. All authors have seen and approved the final version of the report.

Conflict of interest statement

We declare that we have no conflict of interest.

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