Impact of pay for performance on ethnic disparities in intermediate outcomes for diabetes: longitudinal study

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**Objective:** To examine the impact of a major pay for performance incentive on trends in the quality of diabetes care in white, black and south Asian ethnic groups in an urban setting in the UK.

**Research Design and Methods:** We developed longitudinal models examining the quality of diabetes care in a cohort of ethnically diverse patients in southwest London using electronic family practice records. Outcome measures were mean blood pressure and HbA1c values between 2000 and 2005.

**Results:** The introduction of pay for performance was associated with reductions in mean systolic and diastolic blood pressure which were significantly greater than that predicted by the underlying trend in the white (-5.8 mm Hg, -4.2 mm Hg), black (-2.5 mm Hg, -2.4 mm Hg) and south Asian (-5.5 mm Hg, -3.3 mm Hg) groups. Reductions in HbA1c levels were significantly greater than that predicted by the underlying trend in the white group (-0.5%) but not in the black (-0.3%) or south Asian (-0.4%) groups. Ethnic group disparities in annual measurement of blood pressure and HbA1c were abolished before the introduction of pay for performance.

**Conclusions:** The introduction of a pay for performance incentive in UK primary care was associated with improvements in the intermediate outcomes of diabetes care for all ethnic groups. However, the magnitude of improvement appeared to differ between ethnic groups, thus potentially widening existing disparities in care. Policy makers should consider the potential impacts of pay for performance incentives on health disparities when designing and evaluating such programmes.
Ethnic minority groups living in developed countries such as the UK and USA generally have a higher prevalence of diabetes and a worse morbidity and mortality profile than the general population (1). For example, the high prevalence of coronary heart disease in south Asian and stroke in black populations with diabetes has been extensively documented (2). Disparities in access to high quality diabetes care exist and may be an important determinant of ethnic group disparities in these health outcomes (3).

The use of pay for performance incentives as a quality improvement tool in health care is increasing internationally (4, 5). However, such incentives may have unintended consequences, including widening existing disparities in access to high quality care (6). Health care disparities are likely to worsen if financial incentives encourage providers to ‘cherry pick’ healthier patients or exclude those not achieving targets from public reporting mechanisms (7, 8). Additionally, such incentives may widen health care disparities if they increase the resource gap between high and low performing health care providers. Despite this potential for harm, information on the impact of pay for performance incentives on health care disparities remains limited (7, 9).

The introduction of the Quality and Outcomes Framework (QOF) in the new family practitioner contract in the UK during 2004 represents the most radical shift towards pay for performance seen in any health care system (10). The majority of practices achieved many of the higher Quality and Outcome Framework targets set for chronic disease management in the first three years of the family practitioner contract (11). A number of ecological studies have compared quality of care in deprived and affluent areas in the UK after the introduction of pay for performance (12, 13). These studies have generally found marginally lower achievement of quality indicators in deprived areas, with evidence of partial attenuation of these differences in the second year of the contract (14). However, the data used for these studies is derived from the financial administration system for the UK pay for performance incentive scheme which contains no patient level information. Little is known about the impact of this program on ethnic disparities in quality of care. In this paper, we examine the impact of a pay for performance incentive scheme on trends in the quality of diabetes management between 2000 and 2005 in white, black and south Asian ethnic groups using individual patient data derived from fifteen family practices in south-west London, UK.

RESEARCH DESIGN AND METHODS

Pay for performance in UK primary care: Pay for performance was introduced in UK primary care as part of the new Family Practitioner contract in April 2004. Around one quarter of family practice income is now derived through the achievement of quality targets for managing chronic diseases such as diabetes, stroke and coronary heart disease through the Quality and Outcomes Framework. The Framework consists of 1000 points, which cover clinical care, practice organisation and patient experience.

Diabetes is one of nineteen disease areas within the clinical domain of the Quality and Outcomes Framework. Of the 93 points available for diabetes care, 52 are allocated for the achievement of treatment targets (Blood pressure $\leq 145/85$ mm Hg [18 points], HbA1c $\leq 7.5\%$ [17 points], HbA1c $\leq 10\%$ [11 points], Cholesterol $\leq 5$ mmol/L / 193 mg/dl [6 points]) and the remainder to the recording of process measures of care, including annual measurement of body mass index [3 points] and retinopathy screening [5 points].
Wandsworth Prospective Diabetes Study (WPDS): In England, the provision of primary care services is the responsibility of primary care trusts. Within each primary care trust, primary care services are delivered by general practitioners working in National Health Service (NHS) general practices. Through the Wandsworth Prospective Diabetes Study (WPDS), Wandsworth Primary Care Trust, located in south-west London, has established comprehensive primary care-based diabetes registers in two localities (Battersea and Wandsworth South). Data for the present study was collected both before (June-Oct 2003) and after (Nov 2005-Jan 2006) the introduction of the new family practitioner contract in the UK in April 2004. All historical HbA1c and blood pressure readings on patients registered with family practices in Battersea were extracted during the 2003 collection. Ethical approval for the study was granted by Wandsworth Local Research Ethics Committee.

Setting and participants: In 2005, the Battersea area contained 16 general practices with a registered population of 120,843. The median list size of practices was 8257 patients but there were fewer smaller sized practices than is typical nationally; six practices had more than 9000 patients, seven practices had between 3000 and 9000 patients and three practices had fewer than 3000 patients.

The population of Wandsworth is younger than that of England, with 74% aged under 45 years (compared with a national average of 60%). Around one in five Wandsworth residents (22%) belong to a non-white ethnic group (15). Of these, 4.9% are Black Caribbean, 3.9% Black African, 2.9% Indian, 2.1% Pakistani and 0.4% are Bangladeshi. Wandsworth has high levels of disparities in income relative to elsewhere in England.

Identification of people with diabetes: The methods we used to develop our disease register for diabetes in Wandsworth have been described previously (16). In brief, we approached all practices in the study area to participate. All patients with Type 1 and Type 2 diabetes were then identified from computerized general practice records in participating practices by searching for diagnoses of diabetes (C10) or diabetes care (66A) Read codes. Read codes are the clinical classification system used in primary care in the United Kingdom. Patients with repeat prescribing for diabetic medications or with an HbA1c greater than 7.4% were also included in our sample. Patients under 18 years, women with gestational diabetes or receiving treatment for polycystic ovarian syndrome rather than diabetes were excluded. A unique patient identifier (NHS Number) was then used to link patient records extracted in both collection periods.

Study variables: We examined the percentage of patients with HbA1c and blood pressure measured and their mean values as they applied to our population between 2000 and 2005. Each indicator is based on clinical information recorded on the practice computer. We used a mean HbA1c and blood pressure value where patients had more than one measurement in a given year. Patient level variables were age, gender, ethnicity, neighbourhood socio-economic status (SES) and duration of diabetes. Family practice level variables were list size, number of full-time family practitioners and neighbourhood SES. These were obtained from the National Primary Care Research and Development Centre, University of Manchester. Patients self-identified their ethnic origin from closed categories based on the classifications which map to those used in the 2001 UK census (15), either at registration or during a consultation at the family practice. The main ethnic categories of the census are: white (British, Irish, other), black (African, Caribbean, other), south Asian (Indian, Pakistani, Bangladeshi, other) and Chinese. We categorized ethnicity into three groups
Pay for performance and ethnic disparities

(white British, black, or south Asian) for our analyses due to small numbers in subgroups. We assigned neighbourhood SES to patients and family practices based on their postcode (zipcode) using the Index of Multiple Deprivation (IMD) 2004 (17). The Index of Multiple Deprivation is the most commonly used method of measuring neighbourhood SES in the UK and is compiled from a variety of sources, including the 2001 census and unemployment and social security benefits records.

**Statistical analyses:** We compared percentage differences in annual measurement of HbA1c and blood pressure between ethnic groups using chi-square tests. Linear regressions for pre-QOF data (2000-2003) for each patient were generated with a time indicator (2000= 1 to 2003= 4) and used the slope and intercept to predict the value at time point 6 (2005). This value represents the expected value of the outcome in 2005 if QOF had not been established. We adjusted this pre-QOF value and the outcome for 2005 (post-QOF) for age and deprivation (both after centering) and found out the mean values for the three ethnic groups using ordinary linear regression.

An additional challenge in the statistical analyses was to accommodate the hierarchical nature of the data, which were years of measurement nested with in patients nested within practices. Ignoring this multi-level clustering would have resulted in faulty estimation of standard errors. We, therefore, used a random effects multi-level model:

\[ y_{ijk} = \beta_{0ijk} + \beta_{1ijk}X_1 + \beta_{2ijk}X_2 + \beta_{3ijk}X_3 + \beta_{0ijk} + \nu_{0ijk} + u_{0ijk} + \epsilon_{0ijk} \]

where the beta’s were the coefficients; X’s the vector of explanatory variables; and \( \nu, u, \) and \( \epsilon \) the variance components for practice, patient and time respectively; the numerical subscripts represent the levels, the letter subscripts identify the \( i^{th} \) time point for the \( j^{th} \) patient in the \( k^{th} \) practice. The overall fit of the models were assessed using the change in the deviance score compared to an intercept only model with the degrees of freedom equal to number of parameters in the model. Significances of the beta coefficients were assessed using the Wald test. Our intra-class correlation coefficients at individual and practice levels were: systolic (0.450, 0.014), diastolic (0.386, 0.016) and HbA1c (0.527, 0.015). Our trend analysis was restricted to cases with complete information on the respective outcome and our multi-level analysis used all available data. The analyses were done using MIWin 2.02.

**RESULTS**

We identified 1968 adults (≥ 18 years) with diabetes continuously registered with 15 (of 16) participating family practices between 2003 and 2005 and with a previous blood pressure or Hba1c measurement. 996 were men and 972 were women. Ethnicity was recorded in 98.6% of the sample; 37.8% were white British (744), 33.4% were black (658), 10.1% were south Asian (199) and 17.2% belonged to other ethnic groups (339).

The south Asian group were less likely to have their blood pressure measured than the white group during 2000 and 2001 although these differences were not statistically significant. Disparities in blood pressure recording were not evident from 2002, before the introduction of pay for performance incentives in 2004. The south Asian and black groups were less likely to have their blood glucose measured than the white group during 2000-2002. However, these differences were not evident in 2003-2005 (Table 1).

**Table 1 here**

The introduction of pay for performance was associated with reductions in mean systolic and diastolic blood pressure which were
significantly greater than that predicted by the underlying trend in the white (-5.8 mm Hg, -4.2 mm Hg), black (-2.5 mm Hg, -2.4 mm Hg) and south Asian (-5.5 mm Hg, -3.3 mm Hg) groups (Figure 1, Table 2). Reductions in HbA1c levels were significantly greater than that predicted by the underlying trend in the white group (-0.5%) but not in the black (-0.3%) or south Asian (-0.4%) groups.

CONCLUSIONS

The introduction of a major pay for performance incentive in UK primary care was associated with reductions in mean systolic and diastolic blood pressure and blood glucose in patients with diabetes, which were significantly greater than that predicted by underlying trends in improvement. However, this incentive scheme may have had differential impacts on different ethnic groups, potentially widening of disparities in intermediate outcome control in black, white and south Asian groups.

Few UK or US studies have examined the impact of pay for performance incentives on ethnic disparities in access to quality health care. A recent review of the literature on the impact of performance incentives (defined to include both pay for performance and public reporting programmes) on ethnic disparities in care identified only one study which examined this issue (7). This study found that the release of Coronary Artery Bypass Graft (CABG) report cards in New York was associated with a widening of the disparity in CABG use between white versus black and Hispanic patients (18). Whilst non-financial quality improvement initiatives have been associated with reductions in ethnic disparities in process measures in chronic disease management, variations in prescribing and intermediate clinical outcomes have generally not been attenuated (19, 20). Our findings are more robust than those presented in our earlier, preliminary analysis of ethnic disparities in diabetes care as we have used longitudinal data with five measurement points, adjusted for duration of disease and included family practice level variables within a multi-level statistical model (21). Our findings confirm those from other UK studies which suggest that the processes of care for diabetes were generally equitable between
ethnic groups before the introduction of the family practitioner contract in 2004 (22). This finding probably reflects the impact of a considerable and sustained investment in quality improvement initiatives in the UK which predate the introduction of pay for performance, including national service frameworks and national clinical guidance as well as educational and clinical audit activities.

Our study has a number of strengths and limitations. Our findings represent a more complete picture of disparities in diabetes management than that derived from national contract data, which lacks patient level information on variables such as age, sex, ethnicity and socio-economic status and may underestimate variations in care. However, unlike studies based on national data, we are unable to report information on cholesterol control. Like Campbell et al (23), our estimates of improvements in blood pressure and HbA1c control associated with the Quality and Outcomes Framework in the family practitioner contract may be conservative. As the contract was agreed in March 2003, family practitioners may have begun to improve the quality of care on incentivised indicators before its introduction in April 2004 thereby inflating the quality of care measured during our final, pre-contract measurement point (June to October 2003). We have exercised caution in interpreting our findings given that we were unable to adjust for the presence or severity of co-morbid medical conditions or medication usage which may have been confounders in the relationship between ethnicity and diabetes management (24).

Our analysis is based on data extracted eighteen months after the implementation of pay for performance. Longer term studies are necessary to assess the full impact of pay for performance incentives on disparities in diabetes outcomes. The high percentage of patients with their ethnicity coded on practice computers (98.6%) in this study is unique in a UK primary care setting. Despite this we had to combine Indians, Pakistanis and Bangladeshis into a single “south Asian” category and black African and Caribbeans into a “black” category, due to insufficient numbers in subgroups. This may have masked differences in diabetes management and outcomes among these culturally and epidemiologically heterogeneous groups.

Although pay for performance was associated with some widening of disparities in diabetes control between ethnic groups, the magnitude of these differences was generally modest and the associated clinical impact is likely to be small. However, the persisting disparities in intermediate outcomes identified in this study after the introduction of pay for performance remain a concern. For example, in 2005 mean systolic blood pressure was 133.5 mm Hg and 138.9 mm Hg and mean diastolic blood pressure was 75.8 mm Hg and 78.7 mm Hg in the white and black groups respectively.

Our findings suggest that policy makers and health care planners should consider the potential negative impacts of pay for performance incentives on health care disparities during the design of new programs. The development of a pay for performance program designed to reduce ethnic disparities in hospital care in the Massachusetts Medicaid Program represents a promising step forward (25). Existing pay for performance programs should be subject to routine monitoring for possible negative impacts on health care disparities and adjusted to minimize these effects if they are identified. This monitoring should include an examination of whether ethnic minorities and other socially disadvantaged groups are overrepresented amongst those patients excluded from performance reporting mechanisms. Future research should seek to identify the features of pay for performance programs that both promote overall
improvements in health care quality and reduce disparities. In addition, further high quality interventional and observational studies are required to determine the optimal combination of approaches, both universal and targeted, to address ethnic disparities in health.

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Competing interests: AM is Associate Director (Primary Care) of the UK Diabetes Research Network.

Ethical approval: Wandsworth Local Research Ethics Committee
REFERENCES
11. The Quality and Outcomes Framework. The Information Centre. 

Table 1: Percentage of patients with HbA1c and blood pressure measured by ethnic group and year

<table>
<thead>
<tr>
<th>Years</th>
<th>BP measured</th>
<th>White</th>
<th>Black</th>
<th>South Asian</th>
<th>p value</th>
<th>HbA1c measured</th>
<th>White</th>
<th>Black</th>
<th>South Asian</th>
<th>p value</th>
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<tbody>
<tr>
<td>2000</td>
<td></td>
<td>79.1%</td>
<td>82.5%</td>
<td>77.0%</td>
<td>0.25</td>
<td>58.0%</td>
<td>57.1%</td>
<td>54.0%</td>
<td>0.72</td>
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<tr>
<td>2001</td>
<td></td>
<td>83.7%</td>
<td>83.5%</td>
<td>76.3%</td>
<td>0.08</td>
<td>63.3%</td>
<td>59.3%</td>
<td>50.7%</td>
<td>&lt; 0.05</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td>90.3%</td>
<td>89.1%</td>
<td>90.4%</td>
<td>0.72</td>
<td>74.6%</td>
<td>69.1%</td>
<td>67.9%</td>
<td>&lt; 0.05</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td></td>
<td>92.5%</td>
<td>93.3%</td>
<td>92.5%</td>
<td>0.75</td>
<td>80.5%</td>
<td>80.9%</td>
<td>79.9%</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td>96.5%</td>
<td>96.8%</td>
<td>96.5%</td>
<td>0.70</td>
<td>88.3%</td>
<td>90.7%</td>
<td>87.9%</td>
<td>0.28</td>
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</tr>
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Table 2: Predicted and actual mean HbA1c and blood pressure by ethnic group

<table>
<thead>
<tr>
<th></th>
<th>Mean systolic BP</th>
<th>Mean diastolic BP</th>
<th>Mean HbA1c</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Predicted</td>
<td>Actual</td>
<td>Difference</td>
</tr>
<tr>
<td>White</td>
<td>139.3</td>
<td>133.5</td>
<td>5.8*</td>
</tr>
<tr>
<td>Black</td>
<td>141.4</td>
<td>138.9</td>
<td>2.5*</td>
</tr>
<tr>
<td>South Asian</td>
<td>138.0</td>
<td>132.5</td>
<td>5.5*</td>
</tr>
</tbody>
</table>
Figure 1: Mean HbA1c and blood pressure by ethnic group (2000-2005)