Impact of Pay for Performance on Ethnic Disparities in Intermediate Outcomes for Diabetes: A Longitudinal Study

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OBJECTIVE — The purpose of this study was 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 U.K.

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 A1C 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 those predicted by the underlying trend in the white (−5.8 and −4.2 mmHg), black (−2.5 and −2.4 mmHg), and South Asian (−5.5 and −3.3 mmHg) groups. Reductions in A1C levels were significantly greater than those 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 A1C were abolished before the introduction of pay for performance.

CONCLUSIONS — The introduction of a pay for performance incentive in U.K. 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 programs.

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Ethnic minority groups living in developed countries such as the U.K. and U.S. generally have a higher prevalence of diabetes and a worse morbidity and mortality profile than those of 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 of 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). In addition, 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 U.K. during 2004 represents the most radical shift toward pay for performance seen in any health care system (10). The majority of practices achieved many of the higher QOF targets set for chronic disease management in the first 3 years of the family practitioner contract (11). A number of ecological studies have compared quality of care in deprived and affluent areas in the U.K. 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 are derived from the financial administration system for the U.K. 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 article, 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 15 family practices in Southwest London, U.K.

RESEARCH DESIGN AND METHODS

Pay for performance in U.K. primary care

Pay for performance was introduced in U.K. primary care as part of the new fam-

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ily practitioner contract in April 2004. Approximately 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 QOF. The QOF consists of 1,000 points, which cover clinical care, practice organization, and patient experience.

Diabetes is one of 19 disease areas within the clinical domain of the QOF. Of the 93 points available for diabetes care, 52 are allocated for the achievement of treatment targets (blood pressure ≤145/85 mmHg [18 points], A1C ≤7.5% [17 points], A1C ≤10% [11 points], and cholesterol ≤5 mmol/l/193 mg/dl [6 points]) and the remainder to the recording of process measures of care, including annual measurement of BMI [3 points] and retinopathy screening [5 points].

Wandsworth Prospective Diabetes Study

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 general practices. Through the Wandsworth Prospective Diabetes Study, Wandsworth Primary Care Trust, located in Southwest London, has established comprehensive primary care–based diabetes registers in two localities (Battersea and Wandsworth South). Data for the present study were collected both before (June–October 2003) and after (November 2005–January 2006) the introduction of the new family practitioner contract in the U.K. in April 2004. All historical A1C and blood pressure readings for 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 8,257 patients, but there were fewer smaller sized practices than is typical nationally; six practices had >9,000 patients, seven practices had between 3,000 and 9,000 patients, and three practices had <3,000 patients.

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

Table 1—*Percentage of patients with A1C and blood pressure measured by ethnic group and year*

	BP measured				A1C measured			
	White	Black	South Asian	*P*	White	Black	South Asian	*P*
2000	79.1	82.5	77.0	0.25	58.0	57.1	54.0	0.72
2001	83.7	83.5	76.3	0.08	63.3	59.3	50.7	<0.05
2002	90.3	89.1	90.4	0.72	74.6	69.1	67.9	<0.05
2003	92.5	93.3	92.5	0.75	80.5	80.9	79.9	0.96
2005	96.5	96.8	96.5	0.70	88.3	90.7	87.9	0.28

Data are %.

Identification of individuals 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 U.K. Patients with repeat prescribing for diabetes medications or with an A1C >7.4% were also included in our sample. Patients aged <18 years and women with gestational diabetes mellitus or receiving treatment for polycystic ovarian syndrome rather than diabetes were excluded. A unique patient identifier (National Health Service number) was then used to link patient records extracted in both collection periods.

Study variables

We examined the percentage of patients with A1C 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 A1C and blood pressure value when patients had more than one measurement in a given year. Patient-level variables were age, sex, ethnicity, neighborhood socioeconomic status (SES), and duration of diabetes. Family practice–level variables were list size, number of full-time family practitioners, and neighborhood 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 that map to those used in the 2001 U.K. 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 (white British, black, or South Asian) for our analyses because of the small numbers in subgroups. We assigned neighborhood SES to patients and family practices based on their postcode (zip code) using the Index of Multiple Deprivation 2004 (17). The Index of Multiple Deprivation is the most commonly used method of measuring neighborhood SES in the U.K. and is compiled from a variety of sources, including the 2001 census and unemployment and social security benefits records.

Statistical analyses

We compared percent differences in annual measurement of A1C and blood pressure between ethnic groups using χ^2 tests. Linear regressions for pre-QOF data (2000–2003) for each patient were generated with a time indicator (2000 = 1 to 2003 = 4), and the slope and intercept were used 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

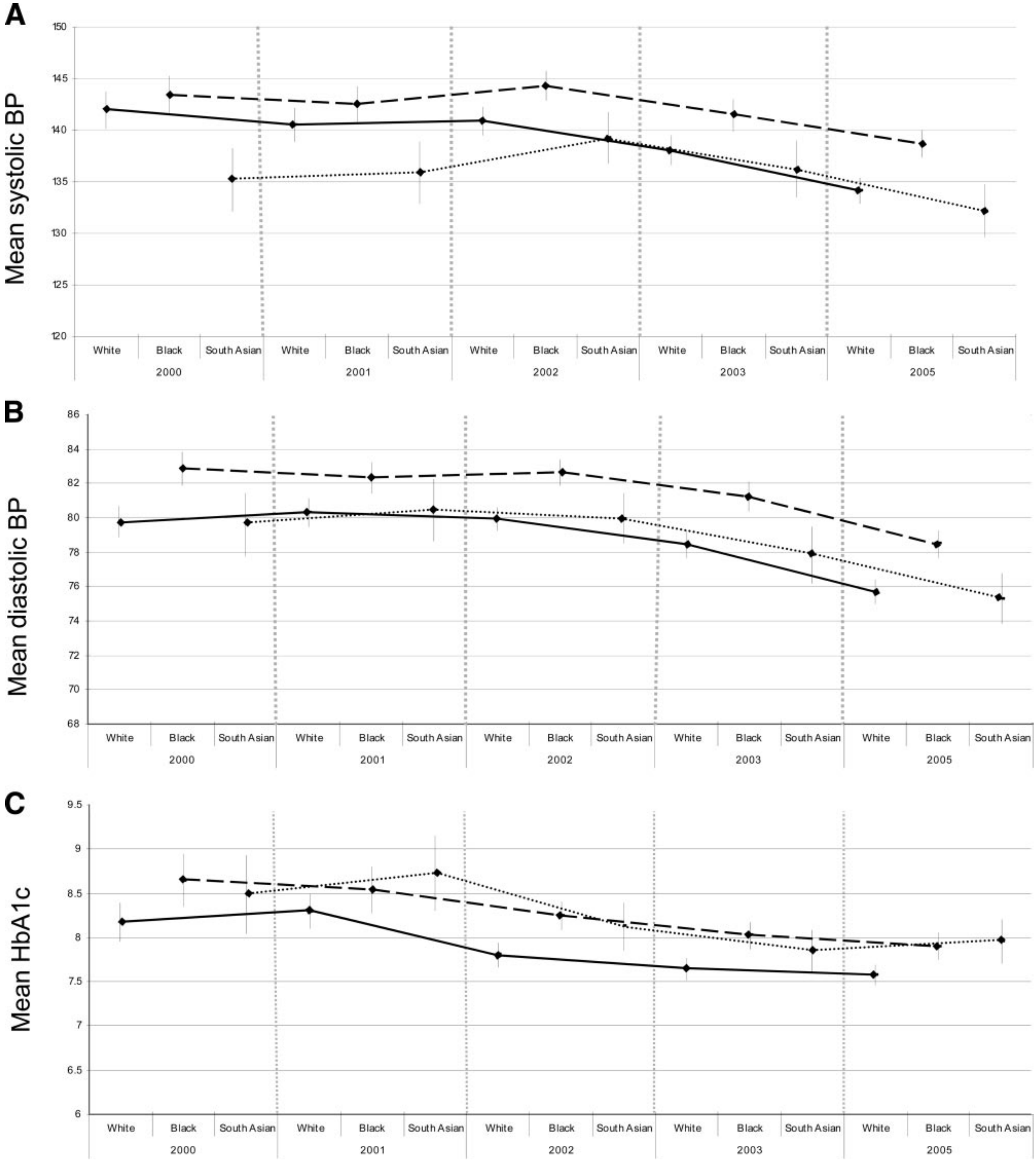

Figure 1—*Mean (95% CI) A1C and blood pressure (BP) by ethnic group (2000–2005). Mean systolic BP* (A)*, mean diastolic BP* (B)*, and mean A1C* (C)*.*

found 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 within patients nested within practices. Ignoring this multilevel clustering would have resulted in faulty estimation of standard errors. We, therefore, used a random effects multilevel model,

$$y_{ijk} = \beta_{0_{ijk}} + \beta_{1_{ijk}}X_1 + \beta_{2_{jk}}X_1 + \beta 3_k X_3$$

$$\beta_{0_{ijk}} = \beta_0 + v_{0_k} + u_{0_{jk}} + e_{0_{ijk}}$$

where the β's are the coefficients, *X*'s are the vectors of explanatory variables, and *v, u,* and *e* are the variance components for practice, patient, and time, respectively; the numerical subscripts represent the levels; and 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

Table 2—*Predicted and actual mean A1C and blood pressure by ethnic group*

	Mean systolic BP (mmHg)			Mean diastolic BP (mmHg)			Mean A1C (%)		
	Predicted	Actual	Difference	Predicted	Actual	Difference	Predicted	Actual	Difference
White	139.3	133.5	5.8*	79.9	75.8	4.2*	8.1	7.6	0.5*
Black	141.4	138.9	2.5*	81.0	78.7	2.4*	8.2	7.9	0.3
South Asian	138.0	132.5	5.5*	77.9	74.6	3.3*	8.3	7.9	0.4

BP, blood pressure. *Statistically significant ($P < 0.05$) within-group difference (Student's *t* test).

was assessed using the change in the deviance score compared with an intercept-only model with the degrees of freedom equal to number of parameters in the model. Significances of the β coefficients were assessed using the Wald test. Our intraclass correlation coefficients at individual and practice levels were systolic (0.450 and 0.014), diastolic (0.386 and 0.016), and A1C (0.527 and 0.015). Our trend analysis was restricted to patients with complete information on the respective outcome, and our multilevel analysis used all available data. The analyses were done using MlWin 2.02.

RESULTS — We identified 1,968 adults (aged ≥18 years) with diabetes continuously registered with 15 (of 16) participating family practices between 2003 and 2005 and with a previous blood pressure or A1C 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 members 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).

The introduction of pay for performance was associated with reductions in mean systolic and diastolic blood pressure levels, which were significantly greater than those predicted by the underlying trend in the white (−5.8 and −4.2 mmHg), black (−2.5 and −2.4 mmHg), and South Asian (−5.5 and −3.3 mmHg) groups (Fig. 1, Table 2). Reductions in A1C 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.

Our multilevel regression models further substantiated the results reported above. The full model with variance components and fit statistics is given in supplemental Table A1 of the online appendix (available at http://dx.doi.org/10.2337/dc08-0912).

In brief, after adjustment for the effects of age, sex, years since diagnosis, practice size, and deprivation both at individual and area levels, the average reductions in systolic and diastolic blood pressure associated with pay for performance were significantly lower in the black (−2.3 and −1.8 mmHg) than in the white (−5.3 and −4.4 mmHg) group. The reductions in blood pressure for the South Asian group were not significantly different from those for the white group. Although A1C level decreased by 0.3% in the white group, no significant associated improvement was found in the black or South Asian groups.

The effect of other variables in the model with reference to pay for performance was variable. The impact of pay for performance on blood pressure and blood glucose levels was not found to vary significantly with the practice level variables examined or with neighborhood SES, either at the patient or practice level. It was associated with a significantly lower improvement in systolic blood pressure levels but a greater improvement in A1C levels with increasing age. Pay for performance was associated with a significantly greater improvement in diastolic blood pressure in men than in women, but this pattern was reversed for A1C.

CONCLUSIONS — The introduction of a major pay for performance incentive in U.K. 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 disparities in intermediate outcome control in black, white, and South Asian groups.

Few U.K. or U.S. 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 programs) on ethnic disparities in care identified only one study, in which this issue was examined (7). This study showed that the release of coronary artery bypass graft report cards in New York was associated with a widening of the disparity in coronary artery bypass graft use between white versus black and Hispanic patients (18). Whereas nonfinancial 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 multilevel statistical model (21). Our findings confirm those from other U.K. studies, which suggested 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 U.K. that predates 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 lack patient level information on variables such as age, sex, ethnicity, and socioeconomic status and may underestimate variations in care. However, unlike studies based on national data, we are unable to report information on cholesterol control. Like those of Campbell et al. (23), our estimates of improvements in blood pressure and A1C control associated with the QOF in the family practitioner contract may be conservative. Because the contract was agreed on in March 2003, family practitioners may have begun to improve the quality of care on incentivized indicators before its introduction in April 2004, thereby inflating the quality of care measured during our final, precontract measurement point (June–October 2003). We have exercised caution in interpreting our findings given that we were unable to adjust for the presence or severity of comorbid 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 18 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 U.K. 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 because of insufficient numbers in subgroups. This combining 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 values were 133.5 and 138.9 mmHg and mean diastolic blood pressure values were 75.8 and 78.7 mmHg 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 among those patients excluded from performance reporting mechanisms. Future researchers 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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