Impact of the GP contract on inequalities associated with influenza immunisation: a retrospective population-database analysis

INTRODUCTION

Influenza infection causes significant morbidity and mortality, particularly among older people and those who are chronically ill.1 During years with modest, seasonal influenza activity, GP consultation rates in England for influenza and influenza-like illness range from 20 to 70 per 100 000 population per week, with 3000–4000 deaths being attributable to influenza annually. During the epidemic of 1989–1990, this rate peaked at 583 consultations per 100 000 population per week, resulting in an estimated 23 000 additional deaths due to influenza over this period.2,3

Influenza immunisation has been available for almost 60 years.4 Although there is continuing debate about its effectiveness in preventing serious illness,4–11 it has been recommended since the 1990s for everyone aged ≥65 years, and for younger people in clinical-risk groups, such as those with chronic respiratory and cardiovascular disease, diabetes, asthma requiring regular inhaled corticosteroids, and those receiving immunosuppressive treatment.3

Before the 2004 General Medical Services (GMS) contract was implemented, GPs were incentivised to immunise older people on their patient lists through a payment linked to achieving a target percentage (60% in 2000, rising to 70% from 2002) and a fee-for-service payment for younger people at risk. After this, uptake of influenza immunisation in those aged ≥65 years across the UK gradually increased. In Scotland, uptake among those aged ≥65 years rose from 65.0% in 2000–2001 to 69.0% in 2002–2003, compared with 65.4% and 68.6% in England.3 However, only 25.0% of younger people in clinical-risk groups were estimated to be immunised in 2004–2005, with large variations both geographically and by disease groups.12,13 Additionally, uptake among people living in areas of greater socioeconomic deprivation has been consistently lower than among the affluent.14–16

From April 2004, the Quality and Outcomes Framework (QOF) of the GMS contract additionally incentivised GPs to immunise individuals with coronary heart disease (CHD), stroke and transient ischaemic attack, diabetes, chronic obstructive pulmonary disease (COPD), and asthma. The incentive to immunise people with asthma was removed in April 2006. Existing target payments for older people and fee-for-service payments for younger people at risk were left unchanged.

The uptake of population-level health-improvement strategies, including immunisation programmes, is known to be socioeconomically patterned.14–18 Since its introduction in 2004, several practice-level studies have shown that the QOF appears to have narrowed or abolished differences in practice-level socioeconomic gradients in healthcare quality for blood pressure control in people with hypertension19 and for a composite of 48 QOF clinical activity indicators.20 However, patient-level analysis...
of care for people with diabetes has shown that inequalities between different ethnic groups have not reduced.\textsuperscript{21,22}

The aim of this study was to measure changes in population-level influenza-immunisation uptake between 2003–2004 (the year before the QOF was introduced) and 2006–2007 (the third year of the contract), and examine how uptake varied by patient characteristics including socioeconomic status and age. Ecological analyses may be misleading and the impact of the QOF on inequalities for other measures should be examined using patient-level data. Where inequalities are persistent, more targeted quality improvement and support may be required to reduce them.

**How this fits in**

Historically, uptake of influenza immunisation has been lower among younger patients and those with greater socioeconomic deprivation. In ecological analysis at practice level, the financial incentives introduced in the 2004 Quality and Outcomes Framework (QOF) appear to reduce socioeconomic inequalities across many targeted measures. In this patient-level analysis, despite significant increases in the uptake of influenza immunisation between 2003–2004 and 2006–2007, and the narrowing of differences between practices, large inequalities according to socioeconomic status and age persisted. Ecological analyses may be misleading and the impact of the QOF on inequalities for other measures should be examined using patient-level data. Where inequalities are persistent, more targeted quality improvement and support may be required to reduce them.

Influenza-immunisation uptake was measured for each disease indication and was stratified by whether or not the patient was aged \( \geq 65 \) years (as this is an independent indication); changes between the two seasons were measured. For each of the years, variation in uptake was examined using multilevel logistic regression to examine how receipt of influenza immunisation varied by patient and practice characteristics, and between practices after adjustment for patient variables. For this analysis, a single ‘indication’ variable was constructed, based on whether or not the patient was aged \( \geq 65 \) years and the number of chronic conditions the patient had that conferred eligibility for influenza immunisation.

Variation by patient and practice characteristics was examined with multilevel univariate and adjusted odds ratios (ORs). Variation between practices was estimated by calculating intracluster correlation coefficients in the empty models, as well as the median ORs for two patients randomly sampled from different practices in models with patient variables fitted to account for differences in case mix.\textsuperscript{25} All models were fitted with second-order, penalised, quasi-likelihood estimation, and assumptions of normality of level-two residuals and other model diagnostics checked graphically. Initial data management and analysis was conducted in SPSS (version 17) and multilevel modelling in MLwin (version 2.1).

**RESULTS**

On 1 September 2006, 358 330 of 1 760 223 patients in the dataset were eligible for influenza immunisation, compared with 327 423 on 1 September 2003. Table 1 shows the percentages of patients receiving immunisation by indication in the 2003–2004 and 2006–2007 influenza seasons. In 2003–2004, uptake among corticosteroids (defined as a person coded as having asthma and receiving three or more inhaled corticosteroid prescriptions in the previous 12 months).

For each patient, demographic data (age, sex, and postcode-defined Carstairs deprivation score treated as a pre-defined seven-category variable),\textsuperscript{26} together with the date of their last influenza immunisation were extracted. Additional practice-level variables were also obtained, namely: list size, defined as quartiles; whether or not the practice was accredited for postgraduate training; and whether the practice held a General Medical Services or Personal Medical Services contract.

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eligible patients was consistently higher in people aged ≥65 years compared with younger people, irrespective of chronic-disease indication.

Overall immunisation rates rose by 3.5% (95% CI = 3.3 to 3.7) in 2006–2007 compared with 2003–2004, with a larger increase of 8.8% (95% CI = 8.3 to 9.4) in those aged <65 years compared with 3.3% (95% CI = 3.1 to 3.6) in patients aged ≥65 years. Immunisation rates rose significantly for all groups except people with diabetes aged ≥65 years; for this group there was a non-significant fall of 0.5% (albeit from the highest 2003–2004 baseline). Rates increased more in patients with a disease indication than in those eligible only by being aged ≥65 years. For patients with a disease indication, rates increased more in younger patients than older patients (although from a much lower base). However, although the gap narrowed, large differences between younger and older people with chronic conditions remained in 2006–2007.

Table 2 shows uptake by patient and practice characteristics for both seasons, with univariate and adjusted multilevel ORs. There was significant, large variation by indication and by socioeconomic status. Influenza immunisation increased with the number of chronic conditions for both younger and older people; this gradient was steeper in 2006–2007 than 2003–2004. However, in 2003–2004, younger patients with one or two chronic conditions were less likely to be immunised than older patients with no chronic condition; this remained true in 2006–2007 for younger people with one chronic condition compared with older people with no chronic conditions. Patients living in the most deprived areas were less likely to be immunised than those living in the most affluent in both 2003–2004 (difference 11.7%, 95% CI = 10.7 to 12.7) and 2006–2007 (8.2%, 95% CI = 7.3 to 9.1); adjusted ORs were similar in both seasons. Although there were statistically significant differences between males and females, the absolute differences are small (1.2%). There was significant variation with regard to immunisation uptake between practices in both seasons, which was not explained by differences in case mix. Patients in larger practices were less likely to be immunised in 2003–2004 than 2006–2007, but differences were smaller in 2006–2007 and not statistically significant in the adjusted model. Other practice-level variables were not significantly associated with influenza-immunisation uptake.

Variation between practices reduced between 2003–2004 and 2006–2007. The intracluster correlation coefficient (the
proportion of variation in uptake attributable to variation between practices) in the empty model was 0.111 in 2003–2004 compared with 0.029 in 2006–2007 [data not shown]. After adjustment for patient characteristics, the median OR for two patients randomly selected from different practices fell from 2.13 (95% CI = 2.00 to 2.26) to 1.44 (95% CI = 1.40 to 1.49) [data not shown].

**DISCUSSION**

Summary

Overall, influenza-immunisation uptake rose across all target and socioeconomic groups between 2003–2004 and 2006–2007, and differences between practices were significantly reduced. However, inequalities by socioeconomic deprivation and age persisted. People living in more deprived areas were less likely than their wealthier counterparts to be immunised in both the 2003–2004 and 2006–2007 seasons, likewise younger patients were less likely to be immunised compared with older people.

**Strengths and limitations**

This study is observational in design and, therefore, it is not possible to ascribe the increased uptake of influenza immunisation to the QOF alone; the QOF is only one policy among many that affected uptake, which, it should be noted, had been rising before 2004.3,14,26 However, it is notable that the largest increases in immunisation uptake were in patients for whom the QOF provided additional financial incentives. This is consistent with the QOF contributing significantly to changes in practice processes; but due to important unmeasured variables, confounding cannot be excluded.

Although practices received a financial incentive based on recording immunisation in both years, and were incentivised to maintain a register for all of the chronic conditions included from April 2004.
Towards the end of the study, the research relied on routine clinical data. Interestingly, overall uptake measured in this study is very close to previously reported national data for patients aged ≥65 years (72.3% in this study versus 72.5% across Scotland in 2003–2004 and 75.6% versus 75.2% in 2006–2007), which is consistent with the recording of influenza immunisation being accurate in both the 2003–2004 and 2006–2007 seasons. In addition, the dataset is truly representative of the wider population, with representation of those populations which have higher levels of deprivation.21

**Comparison with existing literature**

Most previous studies examining influenza-immunisation uptake have used smaller datasets or are based on self-report in national surveys.12–14,27 Coupland et al analysed uptake using data from 413 practices in the QRESEARCH database; however, their time series ended just after the first year of the QOF and the chronic diseases examined did not fully match with the QOF.13 To the authors’ knowledge, this is the first study that has examined changes in uptake of influenza immunisation and inequalities after implementation of the QOF.

In contrast to the two most significant previous UK studies examining socioeconomic inequalities in care in the first 3 years of QOF implementation,14,28 this study found a persistent social gradient. Ashworth et al found that a 1.7% gap between mean blood pressure recording levels in 2004–2005 in practices in the least and most deprived quintiles narrowed to 0.2% in the first 3 years of the QOF.14 Similarly, using a composite of 48 clinical activity indicators, Doran et al found that differences in median achievement narrowed from 4.0% to 0.8% over the same time period.20

There are several reasons why this study may have found different results. The impact of the QOF on inequalities may depend on the care being examined. For example, reductions in inequalities would plausibly be greater for simple process measures28 that are under more control of practices, than for more complex processes that are harder to deliver opportunistically (such as eye screening for patients with diabetes) or are those that are time dependent (such as influenza immunisation). This implies that composite measures may, potentially, conceal persisting inequalities for particular kinds of care, and analyses based on composites should also examine changes for individual measures.

In addition, this study used patient-level data, whereas the two previous studies were ecological practice-level analyses, where practice socioeconomic status was based on the practice postcode. Using practice postcode rather than an aggregate of patient-postcode data in practice-level analyses has been shown to underestimate the degree of socioeconomic inequality found in patients29 and, more generally, ecological analysis is known to be an unreliable method for assessing inequalities at individual level. As with previous ecological analyses, differences between practices reduced in this study, but socioeconomic differences between patients were persistent.

Consistent with this, a recently published systematic review identified three studies that used patient-level data to examine socioeconomic inequalities after implementation of the QOF.30 McGovern et al examined changes in CHD management between 2004 and 2005, and found that, compared with their more affluent counterparts, patients in the most deprived areas were less likely to have their blood pressure measured and receive beta-blockers or influenza immunisation, although they were more likely to receive antplateletls and angiotensin-converting enzyme inhibitors.31

Simpson et al used a similar study design to examine the impact of the QOF on stroke care 1 year after contract implementation. They found that significant differences persisted between patients in the areas of most and least deprivation, with patients with stroke in the most deprived areas being less likely to have their smoking status or blood pressure recorded.32 Further, Millet et al found that the proportion of patients with diabetes with documented smoking-cessation advice increased dramatically (from 48% in 2003 to 83.5% in 2005), and that the prevalence of smoking had decreased significantly among all socioeconomic groups in the first year of implementation of the QOF.33

The findings of this study are, therefore, consistent with other patient-level analyses, showing that socioeconomic inequalities are persistent for some (but not all) important indicators of quality. As such, ecological or composite indicator analyses showing reducing socioeconomic inequalities should be confirmed by patient-level analyses and careful examination of individual indicators.

More generally, although inequalities in influenza immunisation were persistent, this study did not find evidence to support

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**Funding**

NHS Quality Improvement Scotland funded the study but had no role in study design, analysis, interpretation or the decision to publish.

**Ethical approval**

All data was fully anonymised and data use was compliant with the Primary Care Clinical Informatics Unit research governance process. NHS Research Ethics Service review was therefore not required.

**Provenance**

Freely submitted; externally peer reviewed.

**Competing interests**

The authors have declared no competing interests.

**Acknowledgements**

We would like to thank the practices who contributed data to the SPICE-PC programme and allowed the anonymised data to be used for research; and the Primary Care Clinical Information Unit at University of Aberdeen who carried out the initial data extraction and management, particularly Katie Wilde and Fiona Chaloner.

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Victoria et al’s ‘inverse-equity’ hypothesis that improving quality will initially widen inequalities.34 Rather, immunisation uptake increased for all groups of patients and gaps narrowed, although not significantly in terms of socioeconomic inequalities. In the same vein, the findings do not support concerns expressed in the US that pay-for-performance systems like the QOF will widen inequalities,35 although this conclusion could depend, in part, on the QOF payment-system design, where the ability to exception-report means practices are not financially penalised for serving ‘harder-to-reach’ populations.36 However, there was no evidence that socioeconomic differences in uptake were reduced after implementation of the QOF.

Implications for research and practice
The National Audit Office has proposed that ‘there is a need for a mix of QOF indicators and payment weightings to encourage a more interventionist approach among GP practices who have not engaged with their at-risk patients,’ but there is relatively little evidence to guide how best to do this.37 Although uptake in older people achieved by the UK general practice-led Influenza-Immunisation Programme is consistently in the top three of countries that are members of the Organisation for Economic Co-operation and Development, achieving higher uptake in younger people in at-risk groups and among the less affluent might require modification, or alternative forms, of service provision.38 With regard to younger people, implementing and evaluating the efficacy of enhancing delivery through occupational services or area-based services offering more out-of-hours appointments would be valuable.

Within general practice, further work is needed to understand better how high-performing practices in areas of deprivation organise the effective delivery of care, and how pay-for-performance systems like the QOF can better contribute to addressing persistent health inequalities; for example, by weighting payment according to socioeconomic status where inequalities are persistent.
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