Investigating the effect of provider incentives for influenza immunisation
a longitudinal study

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QOF was introduced in 04/05, rewarding GPs for achieving a set of quality targets for patients with chronic conditions.

- 76 clinical indicator for 10 conditions in 04/05 (80 indicators for 19 conditions in 08/09).
- In 04/05, 5 indicators for the influenza immunisation of patients with Asthma, CHD, COPD, DM or Stroke.
- QOF reviewed every two years and in the 06/07 review Asthma7 removed & changes were made to the remaining indicators (CHD12, COPD8, DM18 and STROKE10).
- Patients aged 65+: item-of-service (IoS) fee since 00/01.
- All conditions bar Stroke: IoS fee since 04/05.

Practice achievement calculated as the % of patients for which the indicator was met over eligible patients.

To protect patients against discrimination, practices are allowed to exception report patients from indicators.

Practices achieving...
- below lower threshold (LT) level receive no payment.
- within lower-upper threshold range rewarded on a linear principle.
- above upper threshold (UT) receive no excess payment.

Number of points directly proportional to payment size.

Influenza immunisation indicators in the 06/07 review:
- LT increased for 4 remaining indicators from 25 to 40%.
- UT increased only for CHD12 from 85 to 90%.
Measures of performance

- Reported achievement (RA) - used for the QOF payments:
  - the % of patients for which the indicator was met over eligible patients - after exception reported patients have been removed from both the numerator and denominator.

- Population achievement (PA):
  - the % of patients for which the indicator was met over eligible patients including exception reported patients.

- Exception reporting (ER):
  - the % of exception reported patients over eligible patients including exception reported patients.

Available datasets

- Quality and Measurement System (QMAS):
  - On which the QOF scheme is based.
  - Ready to use RA (since y1), PA and ER (since y2) rates.

- General Practice Research Database (GPRD):
  - Holds event data for more than 270 English practices, from 1999 (545 active practices in Apr10 and 11.2m patients).
  - Final sample of 653,500 patients from 148 nationally representative practices in terms of list size and deprivation (IMD).
  - Can be used to construct RA, PA, ER rates...
  - Data available prior to the introduction of QOF and can be used to extract data for non-incentivised processes and/or diseases.
Influenza immunisation

Background

Mean rates for RA, PA and ER
QOF years 1-5

REPORTED AND POPULATION ACHIEVEMENT

Exception Reporting

RA and ER distributions

CHD12 - worth 7 points
**RA and ER distributions**

**COPD8 - worth 6 points**

![COPD Distribution Chart]

**DM18 - worth 3 points**

![Diabetes Distribution Chart]
Influenza immunisation

RA and ER distributions
STROKE10 - worth 2 points

High levels of achievement but...

- are there performance differences between the indicators which can be attributed to differences in their characteristics?
- what happened to immunisation rates for patients with Asthma after the indicator was removed from the QOF following the first review?
- what were the effects of the introduced changes to the remaining four indicators?
- what were the effects of the various entangled incentivisation schemes over time? (especially QOF)
Investigating the effect of indicator characteristics

- Random effects multilevel multivariate linear regressions used on RA, PA and ER.
- Years, indicators, CHD12 upper threshold change, indicator denominator at the practice level included as independent variables.
- Lower threshold and points could not be including due to perfect collinearity.
- Practices classed into 3 groups, according to their RA in previous year:
  - 90% or above
  - 85% or above but below 90%
  - below 85%
- Included interactions to estimate the effect of the upper threshold increase on each of the practice groups.

### Results

#### Regressions’ table

<table>
<thead>
<tr>
<th>variables</th>
<th>RA model*</th>
<th>PA model**</th>
<th>ER model†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff (95% CI)</td>
<td>p-value</td>
<td>Coeff (95% CI)</td>
</tr>
<tr>
<td>2006/07</td>
<td>0.629 (0.543, 0.715)</td>
<td>&lt;0.001</td>
<td>-0.609 (-0.703, -0.516)</td>
</tr>
<tr>
<td>2007/08</td>
<td>0.409 (0.314, 0.504)</td>
<td>&lt;0.001</td>
<td>-1.321 (-1.420, -1.223)</td>
</tr>
<tr>
<td>2008/09</td>
<td>0.268 (0.161, 0.374)</td>
<td>&lt;0.001</td>
<td>-0.806 (-0.911, -0.701)</td>
</tr>
<tr>
<td>CHD12</td>
<td>-0.292 (-0.343, -0.151)</td>
<td>&lt;0.001</td>
<td>-0.167 (-0.323, -0.011)</td>
</tr>
<tr>
<td>DM18</td>
<td>-0.968 (-1.065, -0.871)</td>
<td>&lt;0.001</td>
<td>-2.973 (-3.081, -2.865)</td>
</tr>
<tr>
<td>STROKE10</td>
<td>-2.475 (-2.550, -2.401)</td>
<td>&lt;0.001</td>
<td>-4.235 (-4.318, -4.152)</td>
</tr>
<tr>
<td>Number of patients</td>
<td>0.515 (0.564, 0.466)</td>
<td>&lt;0.001</td>
<td>-0.371 (-0.318, -0.224)</td>
</tr>
<tr>
<td>Upper threshold change for practices with RA ≥ 90% in previous year</td>
<td>0.449 (0.304, 0.594)</td>
<td>&lt;0.001</td>
<td>0.252 (0.092, 0.413)</td>
</tr>
<tr>
<td>Upper threshold change for practices with RA in [85%, 90%) range in previous year</td>
<td>1.096 (0.883, 1.309)</td>
<td>&lt;0.001</td>
<td>0.499 (0.264, 0.734)</td>
</tr>
<tr>
<td>Upper threshold change for practices with RA &lt; 85% in previous year</td>
<td>2.515 (2.275, 2.754)</td>
<td>&lt;0.001</td>
<td>1.161 (0.897, 1.426)</td>
</tr>
</tbody>
</table>

* 8654 practices included. On average, data was available for 8351 practices across indicators and years. Wald’s $\chi^2=11.510$ and $p=0.001$.
** 8493 practices included. On average, data was available for 8228 practices across indicators and years. Wald’s $\chi^2=20.458$ and $p<0.001$.
† 8493 practices included. On average, data was available for 8228 practices across indicators and years. Wald’s $\chi^2=9.017$ and $p<0.001$. 

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Influenza immunisation QMAS analysis

### Method

- Investigating the effect of indicator characteristics
- Random effects multilevel multivariate linear regressions used on RA, PA and ER.
- Years, indicators, CHD12 upper threshold change, indicator denominator at the practice level included as independent variables.
- Lower threshold and points could not be including due to perfect collinearity.
- Practices classed into 3 groups, according to their RA in previous year:
  - 90% or above
  - 85% or above but below 90%
  - below 85%
- Included interactions to estimate the effect of the upper threshold increase on each of the practice groups.
Regressions’ results summary

- Compared to 2005/06, RA was higher in 2008/09.
- But PA since levels in 2008/09 were lower than in 2005/06 (ER increase to blame).
- Practice register size negatively associated with achievement.
- Increase in the CHD12 upper threshold in 2006/07 had a positive effect on achievement:
  - High and low achieving practices alike improved, on average, more in CHD12 than they did in the other indicators in which the UT did not change.
  - Although a large % of the RA increase is due to a large increase in ER, PA was positively affected.

Investigating the effect of incentivisation

- Data on clinical events used to identify patient conditions and construct the QOF influenza immunisation indicators for seven QOF years (01Mar00-31Apr07).
- Patient age, sex and relevant multi-morbidities available.
- To disentangle the incentivisation effects six mutually exclusive patient groups defined, for each of two age categories (45-65 and 65+):
  - None of the five conditions present
  - Asthma diagnosis and none of the other four conditions
  - Stroke diagnosis and none of the other four conditions
  - CHD diagnosis
  - COPD diagnosis, but no CHD diagnosis
  - Diabetes diagnosis, but no CHD and no COPD diagnosis
- Multilevel logistic regression used for each group with age, sex and their interactions included as covariates.
Comparison of condition groups vs no condition, 00/01

**Influenza Immunisation Odds Ratios, 2000/01**
compared to condition free group of same age range

<table>
<thead>
<tr>
<th>Condition</th>
<th>2000/01 Odds Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
<td>8.947</td>
</tr>
<tr>
<td>Stroke</td>
<td>7.115</td>
</tr>
<tr>
<td>CHD</td>
<td>8.935</td>
</tr>
<tr>
<td>COPD</td>
<td>9.527</td>
</tr>
<tr>
<td>DM</td>
<td>6</td>
</tr>
</tbody>
</table>

**Condition groups over time, 45-65**

**Influenza Immunisation Odds Ratios across time for patients aged [45, 65)**
compared to the same patient group, in 00/01
Influenza immunisation

GPRD analysis

Results

Condition groups over time, 65+

Influenza Immunisation Odds Ratios across time for patients aged 65 or over compared to the same patient group, in 00/01

Regressions’ results summary

- Continuous increase in immunisation rates...
  - from 03/04 to 05/06 for condition groups aged [45-65].
  - from 02/03 to 05/06 for condition groups aged 65+.

- Drop in immunisation rates in 06/07 for all groups bar COPD [45-65] and Stroke 65+:
  - for Asthma the odds ratios fell to 04/05 levels or below.
  - for the other conditions odds ratios were above 04/05 levels.

- The QOF increased (often doubled) the immunisation rate in patients aged 45 to 65 with one of the incentivised conditions, compared to the non-incentivised group.

- In contrast, for patients aged 65+, both the incentivised and the non-incentivised group rise.
If the aim of the QOF is continuous improvement (and not only rewarding good practice):
- increasing the upper threshold seems to be the simplest policy decision to that end.

The QOF seems to have increased vaccination rates for those with the incentivised conditions aged 45 to 64.

Rates for both incentivised and non-incentivised groups aged 65+ increased after the introduction of the QOF:
- underlying positive trend for this age group, and therefore the QOF had no additional effect?
- QOF did have a positive effect on the incentivised conditions, but also exerted a positive externality on non-incentivised patients?

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