### Appendix 1. Sample characteristics

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Appendix 2. Flow diagram: Derivation of the main analysis sample

*a. Bladder cancer*

920 patients with bladder cancer (initial sample) → 83 (920, 9%) patients were diagnosed without a pre-referral consultation with a general practitioner

920 - 83 = 837 patients → 82 (920, 9%) patients with missing number of pre-referral consultations

837 - 82 = 755 patients → 15 (920, 1.6%) patients with missing age

755 - 15 = 740 patients (main analysis sample)*

*Gender, haematuria status, ultrasound scan use status, and ‘blood test’ status were completely observed in this sample.*
b. Renal cancer

- 398 patients with renal cancer (initial sample)
- 47 / 398 (12%) patients were diagnosed without a pre-referral consultation with a general practitioner

- 398 - 47 = 351 patients
- 57 / 398 (14%) patients with missing number of pre-referral consultations

- 351 - 57 = 294 patients
- 6 / 398 (1.5%) patients with missing age

- 294 - 6 = 288 patients
- 1 / 398 (0.2%) patients with missing gender

- 288 - 1 = 287 patients (main analysis sample)*

*Haematuria status, ultrasound scan use status, and ‘blood test’ status were completely observed in this sample.
Appendix 3. Comparative evidence on reported frequency of haematuria among patients with bladder, renal, or bladder-renal (urinary tract) cancers. These comparisons indicate that the proportion of patients with recorded haematuria in the national audit dataset used in the present study is comparable to the respective proportions reported in other primary care studies.

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<th>Study</th>
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<th>% frequency of haematuria</th>
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<tr>
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<td>RCGP audit including data on 1,316 cases of urinary tract cancer</td>
<td>Men: 58.6 (55.3 to 61.8)</td>
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<td>Women: 48.7 (43.8 to 53.6)</td>
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<td>Persons: 55.4 (52.7 to 58.1)</td>
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<td>Jones R et al., BMJ 2007</td>
<td>General Practice Research Database (GPRD) (317 cases in analysis samples 1999-2000)</td>
<td>Men: 58.7 (52.8 to 64.4)</td>
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<td>Women: 51.2 (42.1 to 60.2)</td>
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<tr>
<td>Bruyninckx et al., BJGP 2003</td>
<td>Belgian primary care (sentinel network), 1993-1994 (126 patients with urinary tract cancer)</td>
<td>Men: 63.8 (53.2 to 73.3)</td>
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<td></td>
<td>Women: 46.9 (29.5–65.0)</td>
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<td><strong>Bladder</strong></td>
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<tr>
<td>Present study</td>
<td>RCGP audit including data on 920 cases of bladder cancer</td>
<td>Persons: 68.8 (65.7 to 71.8)</td>
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<td>Shepherd EA et al, BJGP 2012</td>
<td>General Practice Research Database (GPRD) (4,935 cases of bladder cancer)</td>
<td>Persons: 52.8 (51.5 to 54.2)</td>
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<td>Belgian primary care, 1993-1994 (87 patients with bladder cancer)</td>
<td>Persons: 70.1 (59.2 to 79.2)</td>
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<td>General Practice Research Database (GPRD) (3183 cases and 15,707 controls).</td>
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Appendix 4. Different logistic regression models, used to explore degree of potential confounding of gender differences by other variables

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<th>Gender and haematuria</th>
<th>Gender, age and haematuria</th>
<th>Gender and use of ultrasound scan</th>
<th>Gender and blood test use</th>
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Appendix 5. Sensitivity analysis using different binary categories of number of pre-referral consultations (two or more vs. one, and four or more vs. one, two or three; three or more vs. one or two used in main analysis)

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<th>Four or more vs. one, two or three consultations</th>
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<tr>
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*As per Table 3 – adjusted model, in main text
Ref.: Reference, US: Ultrasound, UCL: Upper Confidence Limit, LCL: Lower Confidence Limit
Appendix 6. A. Sensitivity analysis using multiple imputation. (Multiple imputation was conducted using chained equations which created 20 imputed datasets)

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<th>Complete case analysis (as Table 3)</th>
<th>Results from multiply imputed complete dataset</th>
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<td>Odds ratio</td>
</tr>
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<td>Men</td>
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<td>Reference 3.31</td>
</tr>
<tr>
<td>Women</td>
<td>1.20</td>
<td>1.20</td>
</tr>
<tr>
<td>16-54</td>
<td>0.59</td>
<td>0.58</td>
</tr>
<tr>
<td>65-74</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>75-84</td>
<td>1.18</td>
<td>1.20</td>
</tr>
<tr>
<td>85+</td>
<td>1.27</td>
<td>1.32</td>
</tr>
<tr>
<td>No haematuria</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Haematuria</td>
<td>0.29</td>
<td>0.29</td>
</tr>
<tr>
<td>No blood test</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Blood test</td>
<td>2.47</td>
<td>2.42</td>
</tr>
<tr>
<td>No ultrasound scan</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Ultrasound scan</td>
<td>1.55</td>
<td>1.53</td>
</tr>
<tr>
<td>Renal [n=287 (complete), min 324 (multiple imputation)]</td>
<td>Odds ratio</td>
<td>Odds ratio</td>
</tr>
<tr>
<td>Men</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Women</td>
<td>1.90</td>
<td>1.86</td>
</tr>
<tr>
<td>16-54</td>
<td>1.05</td>
<td>0.99</td>
</tr>
<tr>
<td>55-64</td>
<td>0.85</td>
<td>0.88</td>
</tr>
<tr>
<td>65-74</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>75-84</td>
<td>0.95</td>
<td>0.93</td>
</tr>
<tr>
<td>85+</td>
<td>0.97</td>
<td>0.95</td>
</tr>
<tr>
<td>No haematuria</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Haematuria</td>
<td>0.64</td>
<td>0.60</td>
</tr>
<tr>
<td>No blood test</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Blood test</td>
<td>2.99</td>
<td>2.74</td>
</tr>
<tr>
<td>No ultrasound scan</td>
<td>Reference</td>
<td>Reference</td>
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<tr>
<td>Ultrasound scan</td>
<td>2.17</td>
<td>1.92</td>
</tr>
</tbody>
</table>

B. Proportion of patients with missing information by data item (n=920 for bladder and n=398 for renal cancer). Information on haematuria status, investigation by ultrasound scan and investigation by ‘blood test’ was complete

<table>
<thead>
<tr>
<th></th>
<th>Complete</th>
<th>Missing</th>
<th>% missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bladder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of pre-referral consultations</td>
<td>838</td>
<td>82</td>
<td>8.9%</td>
</tr>
<tr>
<td>Primary Care Interval</td>
<td>785</td>
<td>135</td>
<td>14.7%</td>
</tr>
<tr>
<td>Gender</td>
<td>919</td>
<td>1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Age group</td>
<td>899</td>
<td>21</td>
<td>2.3%</td>
</tr>
<tr>
<td>Renal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of pre-referral</td>
<td>341</td>
<td>57</td>
<td>14.3%</td>
</tr>
<tr>
<td>consultations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td>Primary Care Interval</td>
<td>298</td>
<td>100</td>
<td>25.1%</td>
</tr>
<tr>
<td>Gender</td>
<td>396</td>
<td>2</td>
<td>0.5%</td>
</tr>
<tr>
<td>Age group</td>
<td>388</td>
<td>10</td>
<td>2.5%</td>
</tr>
</tbody>
</table>
Appendix 7. Population health impact illustration

In the UK each year about 2,900 and 3,000 women are diagnosed with bladder and renal cancer, respectively. We use the values of 2,929 and 2,992 women with bladder and renal cancer, respectively, as the basis of subsequent calculations. These figures represent the three-year annual average of incident diagnoses of either cancer in women during 2007-9.

Using data from the national audit, it can be expected that of those women approximately 2,639 women with bladder cancer (or 90%) and 2,580 women with renal cancer (or 86%) will have at least one pre-referral consultation with a general practitioner.

We further estimate that each year in the UK:

- Approximately 435 women with bladder cancer* are currently diagnosed non-promptly because of gender inequalities in GP decision-making (166 presenting with haematuria, and 270 presenting without haematuria).

- Approximately 258 women with renal cancer** are currently diagnosed non-promptly because of gender inequalities in GP decision-making (32 presenting with haematuria, and 258 presenting without haematuria)

Considering both urinary tract cancers together, about 693 women every year are experiencing a non-prompt diagnosis because of gender inequalities. More than a quarter of those women presents with haematuria (197 women, or 28.5%) whereas the remaining women (496, or 71.5%) present without haematuria.

*Or 13% (378 / 2,929) of all women with bladder cancer.
**Or 9% (269 / 2,992) of all women with renal cancer.
### Appendix 8. Supplementary analysis comparing the characteristics of a sub-sample of participating and non-participating practices

<table>
<thead>
<tr>
<th>General practice patient survey – patient experience measures (0-100)</th>
<th>Participating practices</th>
<th>Non-participating practices</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to book within 2 days</td>
<td>534 83.0</td>
<td>2345 83.5</td>
<td>0.27</td>
</tr>
<tr>
<td>Ability to book 2 days ahead</td>
<td>534 75.5</td>
<td>2345 75.7</td>
<td>0.75</td>
</tr>
<tr>
<td>Ability to see preferred doctor</td>
<td>534 74.3</td>
<td>2345 75.7</td>
<td>0.0020</td>
</tr>
<tr>
<td>Doctor communication</td>
<td>534 83.9</td>
<td>2345 83.5</td>
<td>0.055</td>
</tr>
<tr>
<td>Confidence and trust in the doctor</td>
<td>534 84.4</td>
<td>2345 83.8</td>
<td>0.013</td>
</tr>
<tr>
<td>Nurse communication</td>
<td>534 84.8</td>
<td>2345 85.2</td>
<td>0.015</td>
</tr>
<tr>
<td>Overall satisfaction with practice</td>
<td>534 85.8</td>
<td>2345 85.7</td>
<td>0.56</td>
</tr>
<tr>
<td>Quality Outcomes Framework practice scores (0-100)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer indicators composite score</td>
<td>533 93.0</td>
<td>2284 92.7</td>
<td>0.33</td>
</tr>
<tr>
<td>All clinical indicators composite score</td>
<td>533 80.8</td>
<td>2307 80.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Practice population deprivation index (0-100)</td>
<td>534 20.9</td>
<td>2312 22.2</td>
<td>0.015</td>
</tr>
<tr>
<td>Practice list size (patients)</td>
<td>534 7544</td>
<td>2308 6900</td>
<td>0.0012</td>
</tr>
<tr>
<td>Number of practice general practitioners</td>
<td>532 5.2</td>
<td>2315 4.5</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Methods used to produce the data in the above table:** The (English) National Audit of Cancer Diagnosis in Primary Care was co-ordinated at the level of Cancer Networks. Of the 28 cancer networks in England, 20 networks contained general practices which took part in the audit. Of these cancers networks, eleven provided the identity of participating practices, although this was not linked to the audit data at the patient level. Practice comparisons (participating vs. non-participating) were restricted to cancer networks that identified participating practices so as to ensure a like-for-like comparison. Not doing so would have led to potential differences being identified which were due to differences between networks rather than within networks which is our prime focus.
We compared practices using data from the General Practice Patient Survey (GPPS), a,b the Quality Outcomes Framework (QOF, http://www.qof.ic.nhs.uk/) and publicly available data on practice level socio-economic deprivation. For General Practice Patient Survey questions, we first linearly re-scaled items on a 0 to 100 scale. We then calculated shrunken estimates of practice scores from mixed effects models; case-mix adjusted for age, sex, ethnicity, deprivation and self-rated health. For Quality and Outcomes Framework practice scores, we calculated an overall average clinical summary score for each practice using a shrunken estimate of the proportion of patients for whom each measure was met, weighted by the point score for that indicator in the Quality and Outcomes Framework. A summary score was also calculated restricting indicators to those in the cancer domain. Further details of the calculation of these scores and the motivation for the techniques used are given elsewhere. c We also compared the practice’s list size (number of registered patients) (published as part of the Quality and Outcomes Framework) and the number of full-time equivalent doctors working at each practice (provided by the NHS information Centre). Finally we compared practice level socio-economic deprivation scores (calculated by applying the 2007 Lower Super Output Area Index of Multiple Deprivation proportionately to the practice population and made available by the Association of Public Health Observatories, www.apho.org.uk/resource/item.aspx?RID=95729). Formal comparisons between participating practices and non-participating practices were made using a t-test.

Results regarding Appendix 8 analysis (see Table).

- For about half of the patient experience measures considered there was evidence that the participating practices perform, on average, differently to the non-participating practices (Table). However, the differences are of very small magnitude and can be considered trivial. For example, participating practices scored lower on experience of relational continuity of care (i.e. seeing their preferred doctor) with a score of 74.3 out of 100 compared to 75.7 in non-participating practices.

- Regarding cancer domains of clinical quality measures, there was no evidence of differences between those practices who participated and those who did.

- Regarding overall clinical quality indicators, there was strong evidence of a small difference (80.7 out of 100 compared to 80.0).

- There are some more tangible differences in the other practice characteristics with participating practices being somewhat larger on average (by over 600 patients and around 1 full time doctor), and serving slightly less deprived patients. However, such differences are still small compared to the overall distribution seen in England.
References for Appendix 8

