

Supplementary Table 5: Coefficients from propensity score models (logistic regression models)

| Wisdom tooth impacted<br>(org type=="ISHP") |             |               |        | Wisdom tooth NEC<br>(org type=="ISHP") |             |               |        | Cholecystectomy<br>(org type=="ISHP") |             |              |        |
|---|-------------|---------------|--------|--|-------------|---------------|--------|---------------------------------------|-------------|--------------|--------|
| F091  | Odds Ratios | CI            | p      | F093                                   | Odds Ratios | CI            | p      | J183                                  | Odds Ratios | CI           | p      |
| Predictors                                  |             |               |        | Predictors                             |             |               |        | Predictors                            |             |              |        |
| (Intercept)                                 | 0.00        | 0.00 – 0.00   | <0.001 | (Intercept)                            | 0           | 0.00 – 0.00   | <0.001 | (Intercept)                           | 0.02        | 0.02 – 0.02  | <0.001 |
| Sex [Female]                                | 0.95        | 0.92 – 0.98   | 0.001  | Sex [Female]                           | 0.88        | 0.85 – 0.90   | <0.001 | Sex [Female]                          | 1.39        | 1.34 – 1.45  | <0.001 |
| IMD Quintile [5]                            | (ref)       |               |        | IMD Quintile [5]                       | (ref)       |               |        | IMD Quintile [5]                      | (ref)       |              |        |
| IMD Quintile [4]                            | 0.82        | 0.78 – 0.86   | <0.001 | IMD Quintile [4]                       | 0.84        | 0.80 – 0.89   | <0.001 | IMD Quintile [4]                      | 0.96        | 0.91 – 1.00  | 0.053  |
| IMD Quintile [3]                            | 0.84        | 0.80 – 0.88   | <0.001 | IMD Quintile [3]                       | 0.85        | 0.81 – 0.89   | <0.001 | IMD Quintile [3]                      | 0.85        | 0.82 – 0.89  | <0.001 |
| IMD Quintile [2]                            | 0.77        | 0.74 – 0.81   | <0.001 | IMD Quintile [2]                       | 0.82        | 0.78 – 0.86   | <0.001 | IMD Quintile [2]                      | 0.73        | 0.70 – 0.76  | <0.001 |
| IMD Quintile [1]                            | 0.83        | 0.79 – 0.88   | <0.001 | IMD Quintile [1]                       | 0.73        | 0.69 – 0.77   | <0.001 | IMD Quintile [1]                      | 0.62        | 0.59 – 0.65  | <0.001 |
| IMD Quintile                                | 0.70        | 0.57 – 0.86   | 0.001  | IMD Quintile                           | 0.54        | 0.42 – 0.67   | <0.001 | IMD Quintile                          | 0.19        | 0.13 – 0.27  | <0.001 |
| [Unknown]                                   |             |               |        | [Unknown]                              |             |               |        | [Unknown]                             |             |              |        |
| Age   | 1.01        | 1.01 – 1.01   | <0.001 | Age                                    | 1.01        | 1.01 – 1.01   | <0.001 | Age                                   | 0.99        | 0.99 – 0.99  | <0.001 |
| Comorbidity score                           | 0.99        | 0.98 – 1.00   | 0.147  | Comorbidity score                      | 0.95        | 0.94 – 0.96   | <0.001 | Comorbidity score                     | 0.95        | 0.94 – 0.95  | <0.001 |
| Ethnicity [White]                           | (ref)       |               |        | Ethnicity [White]                      | (ref)       |               |        | Ethnicity [White]                     | (ref)       |              |        |
| Ethnicity [Asian]                           | 0.84        | 0.78 – 0.90   | <0.001 | Ethnicity [Asian]                      | 0.79        | 0.73 – 0.85   | <0.001 | Ethnicity [Asian]                     | 0.72        | 0.67 – 0.79  | <0.001 |
| Ethnicity [Black]                           | 0.40        | 0.36 – 0.46   | <0.001 | Ethnicity [Black]                      | 0.43        | 0.38 – 0.48   | <0.001 | Ethnicity [Black]                     | 0.47        | 0.40 – 0.56  | <0.001 |
| Ethnicity [Mixed]                           | 0.89        | 0.77 – 1.02   | 0.106  | Ethnicity [Mixed]                      | 0.83        | 0.71 – 0.96   | 0.013  | Ethnicity [Mixed]                     | 0.88        | 0.72 – 1.07  | 0.224  |
| Ethnicity                                   | 1.15        | 1.11 – 1.19   | <0.001 | Ethnicity                              | 1.15        | 1.11 – 1.20   | <0.001 | Ethnicity                             | 2.21        | 2.13 – 2.30  | <0.001 |
| [Other/Unknown]                             |             |               |        | [Other/Unknown]                        |             |               |        | [Other/Unknown]                       |             |              |        |
| Year [2006]                                 | (ref)       |               |        | Year [2006]                            | (ref)       |               |        | Year [2006]                           | (ref)       |              |        |
| Year [2007]                                 | 0.53        | 0.35 – 0.80   | 0.002  | Year [2007]                            | 0.76        | 0.51 – 1.13   | 0.168  | Year [2007]                           | 0.73        | 0.59 – 0.91  | 0.004  |
| Year [2008]                                 | 1.71        | 1.25 – 2.39   | 0.001  | Year [2008]                            | 1.72        | 1.25 – 2.43   | 0.001  | Year [2008]                           | 1.12        | 0.92 – 1.37  | 0.245  |
| Year [2009]                                 | 6.00        | 4.51 – 8.17   | <0.001 | Year [2009]                            | 2.06        | 1.51 – 2.88   | <0.001 | Year [2009]                           | 2.62        | 2.20 – 3.14  | <0.001 |
| Year [2010]                                 | 11.92       | 9.02 – 16.14  | <0.001 | Year [2010]                            | 6.57        | 4.93 – 8.98   | <0.001 | Year [2010]                           | 3.45        | 2.92 – 4.11  | <0.001 |
| Year [2011]                                 | 20.71       | 15.72 – 27.98 | <0.001 | Year [2011]                            | 15.49       | 11.70 – 21.08 | <0.001 | Year [2011]                           | 4.25        | 3.60 – 5.05  | <0.001 |
| Year [2012]                                 | 17.94       | 13.61 – 24.26 | <0.001 | Year [2012]                            | 17.84       | 13.48 – 24.26 | <0.001 | Year [2012]                           | 5.65        | 4.81 – 6.70  | <0.001 |
| Year [2013]                                 | 27.57       | 20.95 – 37.24 | <0.001 | Year [2013]                            | 15.39       | 11.62 – 20.94 | <0.001 | Year [2013]                           | 6.05        | 5.15 – 7.17  | <0.001 |
| Year [2014]                                 | 15.76       | 11.95 – 21.32 | <0.001 | Year [2014]                            | 23.49       | 17.76 – 31.91 | <0.001 | Year [2014]                           | 6.96        | 5.93 – 8.23  | <0.001 |
| Year [2015]                                 | 19.14       | 14.52 – 25.88 | <0.001 | Year [2015]                            | 14.01       | 10.58 – 19.06 | <0.001 | Year [2015]                           | 7.31        | 6.22 – 8.64  | <0.001 |
| Year [2016]                                 | 12.38       | 9.36 – 16.78  | <0.001 | Year [2016]                            | 6.7         | 5.03 – 9.15   | <0.001 | Year [2016]                           | 7.45        | 6.34 – 8.81  | <0.001 |
| Year [2017]                                 | 23.03       | 17.49 – 31.13 | <0.001 | Year [2017]                            | 14.71       | 11.10 – 20.01 | <0.001 | Year [2017]                           | 8.18        | 6.97 – 9.67  | <0.001 |
| Year [2018]                                 | 33.15       | 25.20 – 44.77 | <0.001 | Year [2018]                            | 19.89       | 15.03 – 27.05 | <0.001 | Year [2018]                           | 8.95        | 7.63 – 10.58 | <0.001 |
| Year [2019]                                 | 36.81       | 27.98 – 49.71 | <0.001 | Year [2019]                            | 24.87       | 18.79 – 33.81 | <0.001 | Year [2019]                           | 8.7         | 7.41 – 10.29 | <0.001 |

Supplementary Table 5: Coefficients from propensity score models (logistic regression models)

| UH repair (prosthetics) |                    |               |        | UH repair (sutures) |                    |               |        | VH repair (prosthetics) |                    |               |        |
|-------------------------|--------------------|---------------|--------|---------------------|--------------------|---------------|--------|-------------------------|--------------------|---------------|--------|
| T242                    | (org type=="ISHP") |               |        | T243                | (org type=="ISHP") |               |        | T272                    | (org type=="ISHP") |               |        |
| Predictors              | Odds Ratios        | CI            | p      | Predictors          | Odds Ratios        | CI            | p      | Predictors              | Odds Ratios        | CI            | p      |
| (Intercept)             | 0.05               | 0.04 – 0.07   | <0.001 | (Intercept)         | 0                  | 0.00 – 0.01   | <0.001 | (Intercept)             | 0.07               | 0.05 – 0.09   | <0.001 |
| Sex [Female]            | 0.7                | 0.68 – 0.73   | <0.001 | Sex [Female]        | 0.83               | 0.79 – 0.86   | <0.001 | Sex [Female]            | 0.78               | 0.74 – 0.83   | <0.001 |
| IMD Quintile [5]        | (ref)              |               |        | IMD Quintile [5]    | (ref)              |               |        | IMD Quintile [5]        | (ref)              |               |        |
| IMD Quintile [4]        | 0.92               | 0.88 – 0.97   | 0.003  | IMD Quintile [4]    | 0.89               | 0.84 – 0.94   | <0.001 | IMD Quintile [4]        | 0.95               | 0.88 – 1.04   | 0.258  |
| IMD Quintile [3]        | 0.81               | 0.77 – 0.86   | <0.001 | IMD Quintile [3]    | 0.78               | 0.74 – 0.83   | <0.001 | IMD Quintile [3]        | 0.79               | 0.73 – 0.86   | <0.001 |
| IMD Quintile [2]        | 0.71               | 0.67 – 0.75   | <0.001 | IMD Quintile [2]    | 0.73               | 0.69 – 0.78   | <0.001 | IMD Quintile [2]        | 0.66               | 0.60 – 0.72   | <0.001 |
| IMD Quintile [1]        | 0.63               | 0.60 – 0.67   | <0.001 | IMD Quintile [1]    | 0.7                | 0.66 – 0.74   | <0.001 | IMD Quintile [1]        | 0.6                | 0.55 – 0.66   | <0.001 |
| IMD Quintile            | 0.38               | 0.27 – 0.52   | <0.001 | IMD Quintile        | 0.34               | 0.24 – 0.47   | <0.001 | IMD Quintile            | 0.67               | 0.47 – 0.95   | 0.028  |
| [Unknown]               |                    |               |        | [Unknown]           |                    |               |        | [Unknown]               |                    |               |        |
| Age                     | 0.99               | 0.99 – 0.99   | <0.001 | Age                 | 1.02               | 1.02 – 1.02   | <0.001 | Age                     | 0.99               | 0.98 – 0.99   | <0.001 |
| Comorbidity score       | 0.95               | 0.94 – 0.95   | <0.001 | Comorbidity score   | 0.94               | 0.93 – 0.94   | <0.001 | Comorbidity score       | 0.94               | 0.93 – 0.95   | <0.001 |
| Ethnicity [White]       | (ref)              |               |        | Ethnicity [White]   | (ref)              |               |        | Ethnicity [White]       | (ref)              |               |        |
| Ethnicity [Asian]       | 0.57               | 0.51 – 0.65   | <0.001 | Ethnicity [Asian]   | 0.66               | 0.58 – 0.74   | <0.001 | Ethnicity [Asian]       | 0.51               | 0.40 – 0.63   | <0.001 |
| Ethnicity [Black]       | 0.33               | 0.28 – 0.39   | <0.001 | Ethnicity [Black]   | 0.33               | 0.28 – 0.38   | <0.001 | Ethnicity [Black]       | 0.43               | 0.34 – 0.54   | <0.001 |
| Ethnicity [Mixed]       | 0.85               | 0.68 – 1.05   | 0.143  | Ethnicity [Mixed]   | 0.54               | 0.43 – 0.68   | <0.001 | Ethnicity [Mixed]       | 0.89               | 0.62 – 1.25   | 0.522  |
| Ethnicity               | 1.85               | 1.77 – 1.93   | <0.001 | Ethnicity           | 1.87               | 1.79 – 1.96   | <0.001 | Ethnicity               | 2.16               | 2.02 – 2.32   | <0.001 |
| [Other/Unknown]         |                    |               |        | [Other/Unknown]     |                    |               |        | [Other/Unknown]         |                    |               |        |
| Year [2006]             | (ref)              |               |        | Year [2006]         | (ref)              |               |        | Year [2006]             | (ref)              |               |        |
| Year [2007]             | 0.2                | 0.14 – 0.29   | <0.001 | Year [2007]         | 2.8                | 1.91 – 4.24   | <0.001 | Year [2007]             | 0.26               | 0.15 – 0.45   | <0.001 |
| Year [2008]             | 1.11               | 0.88 – 1.41   | 0.388  | Year [2008]         | 3.82               | 2.64 – 5.71   | <0.001 | Year [2008]             | 0.7                | 0.46 – 1.06   | 0.091  |
| Year [2009]             | 2.35               | 1.90 – 2.92   | <0.001 | Year [2009]         | 6.29               | 4.40 – 9.33   | <0.001 | Year [2009]             | 1.21               | 0.84 – 1.76   | 0.308  |
| Year [2010]             | 4.48               | 3.68 – 5.51   | <0.001 | Year [2010]         | 12.13              | 8.57 – 17.84  | <0.001 | Year [2010]             | 3.28               | 2.39 – 4.60   | <0.001 |
| Year [2011]             | 6.19               | 5.10 – 7.58   | <0.001 | Year [2011]         | 16.45              | 11.66 – 24.13 | <0.001 | Year [2011]             | 5.46               | 4.03 – 7.59   | <0.001 |
| Year [2012]             | 6.92               | 5.71 – 8.47   | <0.001 | Year [2012]         | 20.57              | 14.61 – 30.13 | <0.001 | Year [2012]             | 6.19               | 4.58 – 8.58   | <0.001 |
| Year [2013]             | 8.13               | 6.71 – 9.93   | <0.001 | Year [2013]         | 22.23              | 15.80 – 32.55 | <0.001 | Year [2013]             | 7.67               | 5.69 – 10.61  | <0.001 |
| Year [2014]             | 8.28               | 6.84 – 10.11  | <0.001 | Year [2014]         | 25.82              | 18.37 – 37.76 | <0.001 | Year [2014]             | 8.76               | 6.50 – 12.09  | <0.001 |
| Year [2015]             | 10.05              | 8.31 – 12.27  | <0.001 | Year [2015]         | 25.74              | 18.31 – 37.65 | <0.001 | Year [2015]             | 11.22              | 8.35 – 15.48  | <0.001 |
| Year [2016]             | 10.7               | 8.86 – 13.07  | <0.001 | Year [2016]         | 29.45              | 20.96 – 43.05 | <0.001 | Year [2016]             | 12.87              | 9.57 – 17.77  | <0.001 |
| Year [2017]             | 11.85              | 9.81 – 14.47  | <0.001 | Year [2017]         | 30.45              | 21.68 – 44.50 | <0.001 | Year [2017]             | 14.68              | 10.92 – 20.24 | <0.001 |
| Year [2018]             | 12.65              | 10.47 – 15.44 | <0.001 | Year [2018]         | 36.4               | 25.93 – 53.18 | <0.001 | Year [2018]             | 14.1               | 10.48 – 19.46 | <0.001 |
| Year [2019]             | 12.17              | 10.07 – 14.86 | <0.001 | Year [2019]         | 37.26              | 26.54 – 54.45 | <0.001 | Year [2019]             | 14.73              | 10.94 – 20.34 | <0.001 |

Supplementary Table 5: Coefficients from propensity score models (logistic regression models)

| W391<br>Predictors | THR (NEC)<br>(org type=="ISHP") |              |        | W401<br>Predictors | TKR (cemented)<br>(org type=="ISHP") |               |        | W411<br>Predictors | TKR (no cement)<br>(org type=="ISHP") |               |        |
|--------------------|---------------------------------|--------------|--------|--------------------|--------------------------------------|---------------|--------|--------------------|---------------------------------------|---------------|--------|
|                    | Odds Ratios                     | CI           | p      |                    | Odds Ratios                          | CI            | p      |                    | Odds Ratios                           | CI            | p      |
| (Intercept)        | 0.04                            | 0.03 – 0.06  | <0.001 | (Intercept)        | 0.03                                 | 0.02 – 0.04   | <0.001 | (Intercept)        | 0.01                                  | 0.01 – 0.02   | <0.001 |
| Sex [Female]       | 0.96                            | 0.88 – 1.03  | 0.26   | Sex [Female]       | 0.94                                 | 0.91 – 0.97   | <0.001 | Sex [Female]       | 0.99                                  | 0.93 – 1.04   | 0.6    |
| IMD Quintile [5]   | (ref)                           |              |        | IMD Quintile [5]   | (ref)                                |               |        | IMD Quintile [5]   | (ref)                                 |               |        |
| IMD Quintile [4]   | 0.85                            | 0.76 – 0.95  | 0.004  | IMD Quintile [4]   | 0.89                                 | 0.85 – 0.93   | <0.001 | IMD Quintile [4]   | 0.92                                  | 0.85 – 0.99   | 0.03   |
| IMD Quintile [3]   | 0.73                            | 0.65 – 0.82  | <0.001 | IMD Quintile [3]   | 0.79                                 | 0.75 – 0.82   | <0.001 | IMD Quintile [3]   | 0.71                                  | 0.66 – 0.77   | <0.001 |
| IMD Quintile [2]   | 0.53                            | 0.46 – 0.59  | <0.001 | IMD Quintile [2]   | 0.69                                 | 0.66 – 0.73   | <0.001 | IMD Quintile [2]   | 0.56                                  | 0.51 – 0.62   | <0.001 |
| IMD Quintile [1]   | 0.43                            | 0.37 – 0.49  | <0.001 | IMD Quintile [1]   | 0.58                                 | 0.54 – 0.61   | <0.001 | IMD Quintile [1]   | 0.46                                  | 0.41 – 0.51   | <0.001 |
| IMD Quintile       | 0.16                            | 0.06 – 0.35  | <0.001 | IMD Quintile       | 0.23                                 | 0.18 – 0.29   | <0.001 | IMD Quintile       | 0.16                                  | 0.08 – 0.29   | <0.001 |
| [Unknown]          |                                 |              |        | [Unknown]          |                                      |               |        | [Unknown]          |                                       |               |        |
| Age                | 1                               | 1.00 – 1.01  | 0.006  | Age                | 1                                    | 1.00 – 1.00   | 0.033  | Age                | 1.01                                  | 1.01 – 1.01   | <0.001 |
| Comorbidity score  | 0.93                            | 0.92 – 0.95  | <0.001 | Comorbidity score  | 0.94                                 | 0.93 – 0.94   | <0.001 | Comorbidity score  | 0.93                                  | 0.92 – 0.94   | <0.001 |
| Ethnicity [White]  | (ref)                           |              |        | Ethnicity [White]  | (ref)                                |               |        | Ethnicity [White]  | (ref)                                 |               |        |
| Ethnicity [Asian]  | 0.44                            | 0.19 – 0.85  | 0.027  | Ethnicity [Asian]  | 0.66                                 | 0.59 – 0.73   | <0.001 | Ethnicity [Asian]  | 0.47                                  | 0.37 – 0.58   | <0.001 |
| Ethnicity [Black]  | 0.18                            | 0.08 – 0.33  | <0.001 | Ethnicity [Black]  | 0.36                                 | 0.28 – 0.46   | <0.001 | Ethnicity [Black]  | 0.28                                  | 0.18 – 0.42   | <0.001 |
| Ethnicity [Mixed]  | 0.54                            | 0.16 – 1.39  | 0.255  | Ethnicity [Mixed]  | 0.91                                 | 0.64 – 1.27   | 0.599  | Ethnicity [Mixed]  | 0.62                                  | 0.34 – 1.06   | 0.096  |
| Ethnicity          | 3.94                            | 3.60 – 4.31  | <0.001 | Ethnicity          | 2.55                                 | 2.44 – 2.67   | <0.001 | Ethnicity          | 1.6                                   | 1.48 – 1.73   | <0.001 |
| [Other/Unknown]    |                                 |              |        | [Other/Unknown]    |                                      |               |        | [Other/Unknown]    |                                       |               |        |
| Year [2006]        | (ref)                           |              |        | Year [2006]        | (ref)                                |               |        | Year [2006]        | (ref)                                 |               |        |
| Year [2007]        | 1.64                            | 1.19 – 2.29  | 0.003  | Year [2007]        | 1.94                                 | 1.49 – 2.57   | <0.001 | Year [2007]        | 1.75                                  | 1.24 – 2.50   | 0.002  |
| Year [2008]        | 1.25                            | 0.91 – 1.75  | 0.176  | Year [2008]        | 2.72                                 | 2.11 – 3.57   | <0.001 | Year [2008]        | 1.26                                  | 0.88 – 1.84   | 0.214  |
| Year [2009]        | 2.67                            | 1.97 – 3.67  | <0.001 | Year [2009]        | 4.24                                 | 3.30 – 5.51   | <0.001 | Year [2009]        | 9.78                                  | 7.28 – 13.43  | <0.001 |
| Year [2010]        | 7.46                            | 5.62 – 10.09 | <0.001 | Year [2010]        | 9.07                                 | 7.15 – 11.68  | <0.001 | Year [2010]        | 11.29                                 | 8.42 – 15.50  | <0.001 |
| Year [2011]        | 10.52                           | 7.93 – 14.21 | <0.001 | Year [2011]        | 10.73                                | 8.47 – 13.80  | <0.001 | Year [2011]        | 16.66                                 | 12.44 – 22.85 | <0.001 |
| Year [2012]        | 9.23                            | 6.93 – 12.52 | <0.001 | Year [2012]        | 12.37                                | 9.78 – 15.90  | <0.001 | Year [2012]        | 20.07                                 | 14.99 – 27.52 | <0.001 |
| Year [2013]        | 7.22                            | 5.39 – 9.84  | <0.001 | Year [2013]        | 14.93                                | 11.82 – 19.16 | <0.001 | Year [2013]        | 15.47                                 | 11.50 – 21.29 | <0.001 |
| Year [2014]        | 1.82                            | 1.28 – 2.61  | 0.001  | Year [2014]        | 16.89                                | 13.39 – 21.67 | <0.001 | Year [2014]        | 19.82                                 | 14.79 – 27.22 | <0.001 |
| Year [2015]        | 5.18                            | 3.76 – 7.22  | <0.001 | Year [2015]        | 20.02                                | 15.87 – 25.67 | <0.001 | Year [2015]        | 26.3                                  | 19.63 – 36.10 | <0.001 |
| Year [2016]        | 5.25                            | 3.75 – 7.45  | <0.001 | Year [2016]        | 22.19                                | 17.60 – 28.44 | <0.001 | Year [2016]        | 27.2                                  | 20.27 – 37.37 | <0.001 |
| Year [2017]        | 2.91                            | 1.96 – 4.32  | <0.001 | Year [2017]        | 23.1                                 | 18.32 – 29.60 | <0.001 | Year [2017]        | 29.5                                  | 21.97 – 40.57 | <0.001 |
| Year [2018]        | 0.68                            | 0.33 – 1.27  | 0.252  | Year [2018]        | 26.56                                | 21.07 – 34.04 | <0.001 | Year [2018]        | 32.27                                 | 23.99 – 44.45 | <0.001 |
| Year [2019]        | 2.3                             | 1.48 – 3.54  | <0.001 | Year [2019]        | 27.3                                 | 21.66 – 34.98 | <0.001 | Year [2019]        | 35.04                                 | 26.08 – 48.21 | <0.001 |

Supplementary Table 5: Coefficients from propensity score models (logistic regression models)

| M653 Prostate resection<br>(org type=="ISHP") |             |              |        | Q074 Hysterectomy<br>(org type=="ISHP") |             |               |        | T212 IH repair (prosthetics)<br>(org type=="ISHP") |             |               |        |
|---|-------------|--------------|--------|---|-------------|---------------|--------|--|-------------|---------------|--------|
| Predictors                                    | Odds Ratios | CI           | p      | Predictors                              | Odds Ratios | CI            | p      | Predictors   | Odds Ratios | CI            | p      |
| (Intercept)                                   | 0.11        | 0.08 – 0.13  | <0.001 | (Intercept)                             | 0.02        | 0.01 – 0.04   | <0.001 | (Intercept)  | 0.06        | 0.04 – 0.07   | <0.001 |
| Sex [Female]                                  | 3.56        | 2.03 – 5.99  | <0.001 | Sex [Female]                            | 1.76        | 1.04 – 3.22   | 0.05   | Sex [Female]                                       | 0.92        | 0.82 – 1.05   | 0.218  |
| IMD Quintile [5]                              | (ref)       |              |        | IMD Quintile [5]                        | (ref)       |               |        | IMD Quintile [5]                                   | (ref)       |               |        |
| IMD Quintile [4]                              | 1.01        | 0.95 – 1.07  | 0.758  | IMD Quintile [4]                        | 0.91        | 0.86 – 0.96   | 0.001  | IMD Quintile [4]                                   | 0.92        | 0.86 – 0.98   | 0.014  |
| IMD Quintile [3]                              | 0.96        | 0.91 – 1.02  | 0.212  | IMD Quintile [3]                        | 0.87        | 0.83 – 0.92   | <0.001 | IMD Quintile [3]                                   | 0.74        | 0.69 – 0.79   | <0.001 |
| IMD Quintile [2]                              | 0.76        | 0.72 – 0.82  | <0.001 | IMD Quintile [2]                        | 0.74        | 0.70 – 0.78   | <0.001 | IMD Quintile [2]                                   | 0.66        | 0.61 – 0.71   | <0.001 |
| IMD Quintile [1]                              | 0.56        | 0.52 – 0.61  | <0.001 | IMD Quintile [1]                        | 0.6         | 0.57 – 0.64   | <0.001 | IMD Quintile [1]                                   | 0.58        | 0.54 – 0.63   | <0.001 |
| IMD Quintile                                  | 0.32        | 0.20 – 0.48  | <0.001 | IMD Quintile                            | 0.27        | 0.18 – 0.38   | <0.001 | IMD Quintile                                       | 0.38        | 0.24 – 0.56   | <0.001 |
| [Unknown]                                     |             |              |        | [Unknown]                               |             |               |        | [Unknown]  |             |               |        |
| Age   | 0.97        | 0.97 – 0.98  | <0.001 | Age                                     | 0.95        | 0.95 – 0.95   | <0.001 | Age  | 0.99        | 0.99 – 0.99   | <0.001 |
| Comorbidity score                             | 0.91        | 0.90 – 0.91  | <0.001 | Comorbidity score                       | 0.81        | 0.81 – 0.82   | <0.001 | Comorbidity score                                  | 0.95        | 0.94 – 0.95   | <0.001 |
| Ethnicity [White]                             | (ref)       |              |        | Ethnicity [White]                       | (ref)       |               |        | Ethnicity [White]                                  | (ref)       |               |        |
| Ethnicity [Asian]                             | 0.71        | 0.63 – 0.81  | <0.001 | Ethnicity [Asian]                       | 0.68        | 0.61 – 0.75   | <0.001 | Ethnicity [Asian]                                  | 0.79        | 0.67 – 0.93   | 0.004  |
| Ethnicity [Black]                             | 0.28        | 0.21 – 0.38  | <0.001 | Ethnicity [Black]                       | 0.53        | 0.47 – 0.61   | <0.001 | Ethnicity [Black]                                  | 0.39        | 0.26 – 0.55   | <0.001 |
| Ethnicity [Mixed]                             | 1.2         | 0.84 – 1.66  | 0.295  | Ethnicity [Mixed]                       | 0.89        | 0.72 – 1.09   | 0.271  | Ethnicity [Mixed]                                  | 0.92        | 0.59 – 1.38   | 0.685  |
| Ethnicity                                     | 2.87        | 2.73 – 3.02  | <0.001 | Ethnicity                               | 2.46        | 2.35 – 2.57   | <0.001 | Ethnicity  | 1.97        | 1.86 – 2.10   | <0.001 |
| [Other/Unknown]                               |             |              |        | [Other/Unknown]                         |             |               |        | [Other/Unknown]                                    |             |               |        |
| Year [2006]                                   | (ref)       |              |        | Year [2006]                             | (ref)       |               |        | Year [2006]  | (ref)       |               |        |
| Year [2007]                                   | 0.41        | 0.31 – 0.54  | <0.001 | Year [2007]                             | 0.3         | 0.17 – 0.52   | <0.001 | Year [2007]  | 0.49        | 0.33 – 0.74   | 0.001  |
| Year [2008]                                   | 1.43        | 1.16 – 1.77  | 0.001  | Year [2008]                             | 2.82        | 2.03 – 3.98   | <0.001 | Year [2008]  | 1.12        | 0.81 – 1.57   | 0.5    |
| Year [2009]                                   | 2.1         | 1.72 – 2.58  | <0.001 | Year [2009]                             | 7.01        | 5.19 – 9.72   | <0.001 | Year [2009]  | 2.45        | 1.83 – 3.34   | <0.001 |
| Year [2010]                                   | 3.4         | 2.82 – 4.13  | <0.001 | Year [2010]                             | 13.59       | 10.14 – 18.71 | <0.001 | Year [2010]  | 5.55        | 4.23 – 7.42   | <0.001 |
| Year [2011]                                   | 4.49        | 3.74 – 5.43  | <0.001 | Year [2011]                             | 20.39       | 15.26 – 28.02 | <0.001 | Year [2011]  | 7.76        | 5.95 – 10.33  | <0.001 |
| Year [2012]                                   | 6.02        | 5.03 – 7.25  | <0.001 | Year [2012]                             | 22.47       | 16.82 – 30.85 | <0.001 | Year [2012]  | 9.44        | 7.25 – 12.55  | <0.001 |
| Year [2013]                                   | 6.89        | 5.76 – 8.30  | <0.001 | Year [2013]                             | 27.18       | 20.36 – 37.30 | <0.001 | Year [2013]  | 10.46       | 8.04 – 13.88  | <0.001 |
| Year [2014]                                   | 7.18        | 6.01 – 8.64  | <0.001 | Year [2014]                             | 28.74       | 21.54 – 39.42 | <0.001 | Year [2014]  | 11.72       | 9.02 – 15.53  | <0.001 |
| Year [2015]                                   | 7.86        | 6.58 – 9.46  | <0.001 | Year [2015]                             | 32.58       | 24.44 – 44.67 | <0.001 | Year [2015]  | 12.88       | 9.91 – 17.07  | <0.001 |
| Year [2016]                                   | 8.3         | 6.95 – 10.00 | <0.001 | Year [2016]                             | 35.25       | 26.44 – 48.33 | <0.001 | Year [2016]  | 14          | 10.77 – 18.56 | <0.001 |
| Year [2017]                                   | 8.2         | 6.86 – 9.87  | <0.001 | Year [2017]                             | 33.07       | 24.80 – 45.35 | <0.001 | Year [2017]  | 15.09       | 11.62 – 19.99 | <0.001 |
| Year [2018]                                   | 8.81        | 7.37 – 10.62 | <0.001 | Year [2018]                             | 32          | 23.99 – 43.91 | <0.001 | Year [2018]  | 15.4        | 11.86 – 20.41 | <0.001 |
| Year [2019]                                   | 10.04       | 8.41 – 12.07 | <0.001 | Year [2019]                             | 32.79       | 24.58 – 44.97 | <0.001 | Year [2019]  | 16.81       | 12.94 – 22.28 | <0.001 |

Supplementary Table 5: Coefficients from propensity score models (logistic regression models)

| V255<br>Predictors | Lumbar decompression<br>(org type=="ISHP") |               |        | W371<br>Predictors | THR (cemented)<br>(org type=="ISHP") |             |        | W381<br>Predictors | THR (no cement)<br>(org type=="ISHP") |               |        |
|--------------------|--|---------------|--------|--------------------|--------------------------------------|-------------|--------|--------------------|---------------------------------------|---------------|--------|
|                    | Odds Ratios                                | CI            | p      |                    | Odds Ratios                          | CI          | p      |                    | Odds Ratios                           | CI            | p      |
| (Intercept)        | 0.04                                       | 0.03 – 0.07   | <0.001 | (Intercept)        | 0.1                                  | 0.08 – 0.11 | <0.001 | (Intercept)        | 0.01                                  | 0.00 – 0.01   | <0.001 |
| Sex [Female]       | 0.99                                       | 0.96 – 1.03   | 0.77   | Sex [Female]       | 1.05                                 | 1.01 – 1.08 | 0.009  | Sex [Female]       | 1.04                                  | 1.00 – 1.07   | 0.029  |
| IMD Quintile [5]   | (ref)                                      |               |        | IMD Quintile [5]   | (ref)                                |             |        | IMD Quintile [5]   | (ref)                                 |               |        |
| IMD Quintile [4]   | 1.01                                       | 0.95 – 1.07   | 0.761  | IMD Quintile [4]   | 0.86                                 | 0.83 – 0.90 | <0.001 | IMD Quintile [4]   | 1.03                                  | 0.98 – 1.08   | 0.195  |
| IMD Quintile [3]   | 0.96                                       | 0.90 – 1.02   | 0.148  | IMD Quintile [3]   | 0.74                                 | 0.71 – 0.77 | <0.001 | IMD Quintile [3]   | 0.92                                  | 0.87 – 0.96   | 0.001  |
| IMD Quintile [2]   | 0.85                                       | 0.80 – 0.90   | <0.001 | IMD Quintile [2]   | 0.63                                 | 0.60 – 0.66 | <0.001 | IMD Quintile [2]   | 0.74                                  | 0.70 – 0.78   | <0.001 |
| IMD Quintile [1]   | 0.7  | 0.66 – 0.75   | <0.001 | IMD Quintile [1]   | 0.49                                 | 0.46 – 0.52 | <0.001 | IMD Quintile [1]   | 0.6                                   | 0.56 – 0.64   | <0.001 |
| IMD Quintile       | 0.07                                       | 0.05 – 0.11   | <0.001 | IMD Quintile       | 0.22                                 | 0.16 – 0.29 | <0.001 | IMD Quintile       | 0.08                                  | 0.06 – 0.10   | <0.001 |
| [Unknown]          |  |               |        | [Unknown]          |                                      |             |        | [Unknown]          |                                       |               |        |
| Age                | 0.99                                       | 0.99 – 0.99   | <0.001 | Age                | 0.99                                 | 0.99 – 0.99 | <0.001 | Age                | 1.01                                  | 1.01 – 1.02   | <0.001 |
| Comorbidity score  | 0.94                                       | 0.94 – 0.95   | <0.001 | Comorbidity score  | 0.91                                 | 0.91 – 0.92 | <0.001 | Comorbidity score  | 0.93                                  | 0.93 – 0.94   | <0.001 |
| Ethnicity [White]  | (ref)                                      |               |        | Ethnicity [White]  | (ref)                                |             |        | Ethnicity [White]  | (ref)                                 |               |        |
| Ethnicity [Asian]  | 0.81                                       | 0.71 – 0.92   | 0.002  | Ethnicity [Asian]  | 0.61                                 | 0.45 – 0.83 | 0.002  | Ethnicity [Asian]  | 0.53                                  | 0.40 – 0.69   | <0.001 |
| Ethnicity [Black]  | 0.56                                       | 0.43 – 0.70   | <0.001 | Ethnicity [Black]  | 0.55                                 | 0.38 – 0.77 | 0.001  | Ethnicity [Black]  | 0.36                                  | 0.28 – 0.46   | <0.001 |
| Ethnicity [Mixed]  | 0.74                                       | 0.53 – 1.00   | 0.059  | Ethnicity [Mixed]  | 0.6                                  | 0.33 – 1.01 | 0.071  | Ethnicity [Mixed]  | 0.5                                   | 0.32 – 0.74   | 0.001  |
| Ethnicity          | 1.7  | 1.62 – 1.78   | <0.001 | Ethnicity          | 3.25                                 | 3.12 – 3.39 | <0.001 | Ethnicity          | 1.81                                  | 1.73 – 1.89   | <0.001 |
| [Other/Unknown]    |  |               |        | [Other/Unknown]    |                                      |             |        | [Other/Unknown]    |                                       |               |        |
| Year [2006]        | (ref)                                      |               |        | Year [2006]        | (ref)                                |             |        | Year [2006]        | (ref)                                 |               |        |
| Year [2007]        | 1.41                                       | 0.84 – 2.45   | 0.208  | Year [2007]        | 1.23                                 | 1.05 – 1.44 | 0.01   | Year [2007]        | 2.29                                  | 1.54 – 3.50   | <0.001 |
| Year [2008]        | 1.37                                       | 0.84 – 2.36   | 0.229  | Year [2008]        | 3.07                                 | 2.68 – 3.54 | <0.001 | Year [2008]        | 5.15                                  | 3.58 – 7.69   | <0.001 |
| Year [2009]        | 2.74                                       | 1.73 – 4.59   | <0.001 | Year [2009]        | 3.11                                 | 2.70 – 3.58 | <0.001 | Year [2009]        | 10.95                                 | 7.70 – 16.20  | <0.001 |
| Year [2010]        | 3.73                                       | 2.39 – 6.18   | <0.001 | Year [2010]        | 4.12                                 | 3.59 – 4.73 | <0.001 | Year [2010]        | 17.42                                 | 12.30 – 25.69 | <0.001 |
| Year [2011]        | 6.83                                       | 4.42 – 11.24  | <0.001 | Year [2011]        | 5.2                                  | 4.55 – 5.96 | <0.001 | Year [2011]        | 23.31                                 | 16.48 – 34.36 | <0.001 |
| Year [2012]        | 8.93                                       | 5.80 – 14.65  | <0.001 | Year [2012]        | 5.52                                 | 4.84 – 6.33 | <0.001 | Year [2012]        | 24.51                                 | 17.34 – 36.11 | <0.001 |
| Year [2013]        | 10.63                                      | 6.92 – 17.43  | <0.001 | Year [2013]        | 6.66                                 | 5.84 – 7.61 | <0.001 | Year [2013]        | 30.14                                 | 21.32 – 44.39 | <0.001 |
| Year [2014]        | 12.85                                      | 8.37 – 21.06  | <0.001 | Year [2014]        | 6.77                                 | 5.95 – 7.75 | <0.001 | Year [2014]        | 34.79                                 | 24.63 – 51.20 | <0.001 |
| Year [2015]        | 14.16                                      | 9.23 – 23.20  | <0.001 | Year [2015]        | 7.46                                 | 6.55 – 8.54 | <0.001 | Year [2015]        | 41.56                                 | 29.43 – 61.17 | <0.001 |
| Year [2016]        | 16.15                                      | 10.52 – 26.45 | <0.001 | Year [2016]        | 7.05                                 | 6.18 – 8.07 | <0.001 | Year [2016]        | 43.3                                  | 30.66 – 63.72 | <0.001 |
| Year [2017]        | 17.32                                      | 11.29 – 28.37 | <0.001 | Year [2017]        | 7.07                                 | 6.19 – 8.10 | <0.001 | Year [2017]        | 54.74                                 | 38.77 – 80.55 | <0.001 |
| Year [2018]        | 16.39                                      | 10.68 – 26.83 | <0.001 | Year [2018]        | 8.07                                 | 7.07 – 9.24 | <0.001 | Year [2018]        | 63.16                                 | 44.73 – 92.94 | <0.001 |
| Year [2019]        | 18.2                                       | 11.87 – 29.80 | <0.001 | Year [2019]        | 8.3                                  | 7.28 – 9.51 | <0.001 | Year [2019]        | 65.65                                 | 46.49 – 96.61 | <0.001 |

Supplementary Table 5: Coefficients from propensity score models (logistic regression models)

| W421<br>Predictors | TKR (NEC)<br>(org type=="ISHP") |             |        | W931<br>Predictors | THR (cemented acetabulum)<br>(org type=="ISHP") |                |        | W941<br>Predictors | THR (cemented femoral stem)<br>(org type=="ISHP") |                |        |
|--------------------|---------------------------------|-------------|--------|--------------------|---|----------------|--------|--------------------|---|----------------|--------|
|                    | Odds Ratios                     | CI          | p      |                    | Odds Ratios                                     | CI             | p      |                    | Odds Ratios                                       | CI             | p      |
| (Intercept)        | 0.21                            | 0.16 – 0.27 | <0.001 | (Intercept)        | 0.01  | 0.00 – 0.04    | <0.001 | (Intercept)        | 0.01  | 0.00 – 0.01    | <0.001 |
| Sex [Female]       | 0.95                            | 0.90 – 1.00 | 0.074  | Sex [Female]       | 1.08  | 1.00 – 1.16    | 0.064  | Sex [Female]       | 1.02  | 0.98 – 1.05    | 0.282  |
| IMD Quintile [5]   | (ref)                           |             |        | IMD Quintile [5]   | (ref)   |                |        | IMD Quintile [5]   | (ref)   |                |        |
| IMD Quintile [4]   | 0.99                            | 0.91 – 1.08 | 0.804  | IMD Quintile [4]   | 0.77  | 0.69 – 0.86    | <0.001 | IMD Quintile [4]   | 1   | 0.96 – 1.05    | 0.932  |
| IMD Quintile [3]   | 0.8                             | 0.73 – 0.87 | <0.001 | IMD Quintile [3]   | 0.59  | 0.53 – 0.66    | <0.001 | IMD Quintile [3]   | 0.99  | 0.95 – 1.04    | 0.7    |
| IMD Quintile [2]   | 0.57                            | 0.52 – 0.62 | <0.001 | IMD Quintile [2]   | 0.52  | 0.46 – 0.59    | <0.001 | IMD Quintile [2]   | 0.89  | 0.84 – 0.93    | <0.001 |
| IMD Quintile [1]   | 0.41                            | 0.37 – 0.45 | <0.001 | IMD Quintile [1]   | 0.37  | 0.32 – 0.41    | <0.001 | IMD Quintile [1]   | 0.65  | 0.61 – 0.69    | <0.001 |
| IMD Quintile       | 0.93                            | 0.60 – 1.42 | 0.726  | IMD Quintile       | 1.7   | 1.27 – 2.27    | <0.001 | IMD Quintile       | 0.1   | 0.07 – 0.14    | <0.001 |
| [Unknown]          |                                 |             |        | [Unknown]          |   |                |        | [Unknown]          |   |                |        |
| Age                | 1.01                            | 1.00 – 1.01 | 0.001  | Age                | 1   | 1.00 – 1.01    | 0.078  | Age                | 1   | 1.00 – 1.01    | <0.001 |
| Comorbidity score  | 0.88                            | 0.87 – 0.89 | <0.001 | Comorbidity score  | 0.93  | 0.92 – 0.94    | <0.001 | Comorbidity score  | 0.93  | 0.93 – 0.94    | <0.001 |
| Ethnicity [White]  | (ref)                           |             |        | Ethnicity [White]  | (ref)   |                |        | Ethnicity [White]  | (ref)   |                |        |
| Ethnicity [Asian]  | 0.36                            | 0.28 – 0.45 | <0.001 | Ethnicity [Asian]  | 0.61  | 0.31 – 1.10    | 0.117  | Ethnicity [Asian]  | 0.51  | 0.37 – 0.69    | <0.001 |
| Ethnicity [Black]  | 0.15                            | 0.10 – 0.21 | <0.001 | Ethnicity [Black]  | 0.4   | 0.15 – 0.89    | 0.04   | Ethnicity [Black]  | 0.57  | 0.41 – 0.78    | 0.001  |
| Ethnicity [Mixed]  | 0.33                            | 0.15 – 0.65 | 0.003  | Ethnicity [Mixed]  | 0.82  | 0.26 – 2.17    | 0.706  | Ethnicity [Mixed]  | 0.73  | 0.46 – 1.12    | 0.169  |
| Ethnicity          | 3.7                             | 3.46 – 3.95 | <0.001 | Ethnicity          | 3.12  | 2.80 – 3.48    | <0.001 | Ethnicity          | 1.68  | 1.61 – 1.75    | <0.001 |
| [Other/Unknown]    |                                 |             |        | [Other/Unknown]    |   |                |        | [Other/Unknown]    |   |                |        |
| Year [2006]        | (ref)                           |             |        | Year [2006]        | (ref)   |                |        | Year [2006]        | (ref)   |                |        |
| Year [2007]        | 0.54                            | 0.46 – 0.64 | <0.001 | Year [2007]        | 0.67  | 0.15 – 3.46    | 0.608  | Year [2007]        | 2.2   | 1.23 – 4.24    | 0.012  |
| Year [2008]        | 2.37                            | 2.07 – 2.73 | <0.001 | Year [2008]        | 3.09  | 1.08 – 13.04   | 0.066  | Year [2008]        | 0.49  | 0.22 – 1.08    | 0.074  |
| Year [2009]        | 3.05                            | 2.66 – 3.51 | <0.001 | Year [2009]        | 2.78  | 0.98 – 11.65   | 0.094  | Year [2009]        | 3.05  | 1.75 – 5.75    | <0.001 |
| Year [2010]        | 2.99                            | 2.59 – 3.46 | <0.001 | Year [2010]        | 7.89  | 2.89 – 32.50   | 0.001  | Year [2010]        | 9.03  | 5.38 – 16.66   | <0.001 |
| Year [2011]        | 3.95                            | 3.42 – 4.57 | <0.001 | Year [2011]        | 10.95   | 4.06 – 44.89   | <0.001 | Year [2011]        | 10.8  | 6.45 – 19.85   | <0.001 |
| Year [2012]        | 2.74                            | 2.35 – 3.21 | <0.001 | Year [2012]        | 15.84   | 5.90 – 64.81   | <0.001 | Year [2012]        | 15.78   | 9.47 – 28.94   | <0.001 |
| Year [2013]        | 2.25                            | 1.90 – 2.66 | <0.001 | Year [2013]        | 27.03   | 10.11 – 110.36 | <0.001 | Year [2013]        | 23.39   | 14.08 – 42.79  | <0.001 |
| Year [2014]        | 1.98                            | 1.65 – 2.38 | <0.001 | Year [2014]        | 30.16   | 11.30 – 123.01 | <0.001 | Year [2014]        | 33.31   | 20.09 – 60.85  | <0.001 |
| Year [2015]        | 3.78                            | 3.17 – 4.51 | <0.001 | Year [2015]        | 36.32   | 13.63 – 148.03 | <0.001 | Year [2015]        | 38.65   | 23.33 – 70.59  | <0.001 |
| Year [2016]        | 3.55                            | 2.94 – 4.29 | <0.001 | Year [2016]        | 45.93   | 17.25 – 187.12 | <0.001 | Year [2016]        | 47.1  | 28.45 – 85.96  | <0.001 |
| Year [2017]        | 3.68                            | 3.01 – 4.51 | <0.001 | Year [2017]        | 55.61   | 20.88 – 226.54 | <0.001 | Year [2017]        | 49.95   | 30.18 – 91.16  | <0.001 |
| Year [2018]        | 1.06                            | 0.81 – 1.39 | 0.654  | Year [2018]        | 65.12   | 24.45 – 265.33 | <0.001 | Year [2018]        | 54.97   | 33.22 – 100.31 | <0.001 |
| Year [2019]        | 1.39                            | 1.06 – 1.81 | 0.015  | Year [2019]        | 89.44   | 33.55 – 364.58 | <0.001 | Year [2019]        | 58.1  | 35.12 – 106.01 | <0.001 |