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# Are General Practitioners Good for You? Endogenous Supply and Health

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# Are General Practitioners Good for You?
# Endogenous Supply and Health

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## Abstract

We investigate the impact of area general practitioner (GP) supply on individual health in England. If no allowance is made for the endogeneity of GP supply, the effect is positive but not statistically significant. When GP supply is instrumented by age related capitation the effect is markedly greater and statistically significant. A 10% increase in GP supply leads to an increase in the proportion of the population reporting very good health by 6% from 36%.  The estimated cost per quality adjusted life year gained from an additional GP is between £527 and £5740.

JEL classification: I12; I18

## 1. Introduction

Policies in many countries attempt to increase the supply of primary care doctors or family physicans (GPs) to areas perceived as underserved by regulation or financial incentives.  Such policies rest on the premise that increasing the supply of general practitioners will improve the health of the individuals in the area.  Although the premise is plausible, its evidence base is rather weak. Studies to date, which have been mainly on US data, suggest that increased supply of GPs improves health.  But most studies have been at US state level (see for example Shi et at, 2004), and the only two which examine the relationship of area GP supply and individual health have not allowed for endogeneity of GP supply (Shi and Starfield, 2000; Laditka, 2004).  Even health models estimated on rich individual level data sets fail to explain a large proportion of the variation in health.  If the unobservables affecting health are correlated with the factors influencing GPs' choice of area, then estimates of the effect of GP supply on health may be biased.  Moreover the bias could be positive or negative depending on the GP supply function and the variables included in the estimated health model.

The institutional setting in England provides an opportunity to estimate the effect of GP supply on health with less risk than in the US of confounding via insurance and substitutes for GPs such as emergency rooms. In this paper we use a rich multi-level English data set to estimate the effect of area supply of GPs on individual health, controlling for GP supply endogeneity by using instrumental variables. We also use our results calculate the cost-effectiveness of changes in GP supply.

## 2. Methods

### 2.1 Individual data

Individual level data on health and socio-economic status were obtained from the Health Survey for England (HSE) (Sproston and Primatesta, 2003). The HSE is a nationally representative survey of individuals aged two years and over living in England. A new sample is drawn each year and information is collected on health, demographic, and socio-economic factors via interviews. We use three rounds of the HSE from 1998 to 2000, yielding a total of 49,541 observations.

Individual level socio-economic variables were included as covariates in the health equation. They include age, gender, equivalised household income, social class of head of household (seven categories), highest educational qualification attained (seven categories), ethnic group (nine categories) and marital status (five categories). We also included two year indicators, 11 month of interview indicators, and an indicator of whether information for children was obtained from a proxy respondent.

We imputed missing items for covariates. For continuous variables missing values were imputed using the linear prediction from a regression of the variable on the other covariates. For categorical variables missing values are assigned to the omitted category. To allow for the possibility that items are not missing at random we include dummy variables for all imputed items to indicate item non-response.

### 2.2 Health measures

The dependent variable in the health equation is self-reported general health status. Respondents are asked: "How is your health in general? Would you say it was: 'Very good', 'Good', 'Fair', 'Bad', 'Very bad'?". Self-assessed health measures have been shown to be good predictors of subsequent mortality (Idler and Benyammi, 1997) for all socio-economic groups (Burström and Fredlund, 2001) at individual level, to be strongly associated with mortality rates at area level (Kyfinn, Goldacre, Gill et al, 2004), and to reflect 'harder' health indicators of a range of specific health conditions (Sutton et al, 2002).  We used the responses to this question to estimate three health models.

### 2.2.1 Self-assessed general health

We estimate an ordered probit model for the responses $h_{ia}^1 = 1, 2, 3, 4, 5$ to the self assessed general health question where

$$h_{ia}^1 = j \text{ if } \mu_{j-1} < h_{ia}^{1*} < \mu_j, \quad \text{for } j = 1, 2, ..., 5, \quad \mu_0 = -\infty, \mu_5 = +\infty \tag{1}$$

$i$ indexes individuals, $a$ indexes areas, latent health $h_{ia}^*$ is determined by individual ($x_{ia}$) and area ($x_a$) variables and by area GP supply ($g_a$) as

$$h_{ia}^* = \beta_1 x_{ia} + \beta_2 g_a + \beta_3 x_a + \varepsilon_{ia}^1, \quad \varepsilon_{ia}^1 \sim N(0,1) \tag{2}$$

### 2.2.2 Discrete attributed EQ-5D score

The 1996 HSE contains the EuroQol EQ-5D (EuroQol Group, 1990) health instrument. The EQ-5D answers from 16,047 respondents aged sixteen and over were converted to a health utility scale between 0 and 1 using a set of weights for the UK based on the Time Trade-Off technique (Dolan, 1997). An EQ-5D score of 0 represents a health utility equal to being dead and 1 represents the utility associated with full health. We computed the mean EQ-5D score for the individuals in the $j$-th self assessed general health categories in the 1996 HSE and assigned it as the health score for individuals in category $j$ in the 1998 to 2000 rounds of the HSE. We treat this measure ($h^2$) as a cardinal variable and estimate the health model by least squares regression.

### 2.2.3 Continuous attributed EQ-5D score

Although $h^2$ is a cardinal measure it takes on only five values. We use a method for extracting more information from the data which yields a continuous cardinal EQ-5D score for each individual. The method was proposed and validated on good quality Canadian health data by van Doorslaer and Jones (2003, p.65) and subsequently applied to UK data by Sutton (2002) and Gravelle and Sutton (2003). The 1996 HSE data on EQ-5D scores and self-assessed general health are used to set the cut points for the self-assessed health categories (the $\mu$'s in (1)). The cumulative percentages of respondents in the 1996 HSE reporting "very bad" to "good" health are 1.17%, 5.39%, 23.41%, and 64.65%, respectively. Corresponding values from the empirical distribution of EQ-5D scores are -0.016, 0.364, 0.743 and 1.000. If it is assumed that the mapping of latent self assessed general health to EQ-5D scores is stable over time, then the unobserved EQ-5D scores ($h^3$) for HSE respondents in 1998 to 2000 and their reported self assessed general health responses are related by

$$h_{ia}^1 = j \text{ if } \mu_{j-1} < h_{ia}^3 < \mu_j, \text{ for } j = 1, 2, ..., 5 \tag{3}$$

where $\mu_0 = -\infty, \mu_5 = \infty$, $\mu_1 = -0.016$, $\mu_2 = 0.364$, $\mu_3 = 0.743$, and $\mu_4 = 1.00$. With the EQ-5D score determined by

$$h_{ia}^3 = \beta_1 x_{ia} + \beta_2 g_a + \beta_3 x_a + \varepsilon_{ia}^3, \quad \varepsilon_{ia}^3 \sim N(0,1) \tag{4}$$

we use interval regression to estimate the effects of GP supply and the covariates on health measured by the EQ-5D score.

## 2.3 Area data

We constructed area level GP supply variables for 1997, 1998, and 1999 using the General Medical Services (GMS) Statistics database held by the National Primary Care Research and Development Centre (NPCRDC).[1] We computed GP supply at the local authority (LA) level. England is divided into 354 local authorities, which have a mean resident population of 141,235 individuals (range 2,149 to 1,010,427). In the regressions we use the logarithm of the number of whole-time equivalent GPs per 1,000 residents as the GP supply measure. To allow for a lagged effect of GP supply on health, we use one-year lagged values of GP supply throughout.

We also included in the individual level models fifty four local authority variables measuring area socio-economic status and accessibility to other health services. Measures of the accessibility of other types of health service were taken from the Allocation of Resources to English Areas dataset (Sutton et al., 2002). Variables included distances to different types of hospitals, waiting times, beds, and numbers of specialists. Additional area level data were obtained from the Neighbourhood Statistics dataset maintained by the Office for National Statistics.[2] They included crime rates and measures of socio-economic deprivation. Except for GP supply, the Local Authority level variables are time invariant. We also included eight dummy variable for the Government Office regions within which local authorities are situated.

## 2.4 Instrumental variables for GP supply

The National Health Service provides universal tax financed primary and secondary health care. There are no user charges except for drugs provided outside hospital, and because of widely drawn exemptions over 90% of these are dispensed without charge. There is a small private sector which provides elective hospital care and is funded by private employer-based or individual.

Individuals register with general practitioners who provide primary medical services and act as gatekeepers to elective NHS hospital care. GPs in England are self-employed and work in for-profit partnerships with a modal size of four GPs. Their income is determined by a national contract whose main element is a capitation fee for each patient on the GP's list.

From the founding of the NHS in 1948 GPs location decisions were regulated by a national body -the Medical Practices Committee (Medical Practices Committee, 1998). Its aim was to reduce inequalities in the distribution of GPs. It attempted to do so by restricting entry into areas it designated as already adequately supplied with GPs. The entry restrictions were unsuccessful in achieving an equal distribution (Gravelle and Sutton, 2001): GPs in England are much more unevenly distributed than hospital services.

We instrument GP supply using two Local Authority level variables. The first is an index of local area house prices in 2000.[3] There is no cost-of-living adjustment in the national GP contract, so we expect a negative partial correlation between house prices and GP supply. Given the large number of individual and other area variables in the health regression, it is unlikely that area house prices correlate with individual health. Indices are available for apartments, detached houses and semi-detached houses. Experiments showed that the semi-detached house price index had the most significant coefficient in the GP supply model conditional on the other variables and we use this as the instrument.

The second instrument is age related capitation payment per head of population. For each patient on their list GPs receive a capitation fee which increase with the age band (0-64;,65-74, 75+) of the patient. Moreover the age distribution of the population was a factor influencing whether Medical Practices Committee attempted to restrict entry into an area (Medical Practices Committee, 1998). Hence we expect to find more GPs in areas where the population generate higher age related capitation payments,

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[1] http://www.primary-care-db.org.uk/

[2] http://www.neighbourhood.statistics.gov.uk/home.asp

[3] http://www.landreg.gov.uk/propertyprice/interactive/ppr_ualbs.asp

all else equal.  Although age is correlated with health at the individual level, we include the individual's age in the health regressions so that it is plausible that any unobservable factors affecting individual health are uncorrelated with the age of the local authority population.

We computed the weighted average age related capitation payment per person in area $a$ in year $t$ as $\sum_{k=1}^{3} \frac{N_{ka}}{N_a} Q_{kt}$ , where $N_{ka}$ is the number of people in LA $a$ in age band $k$, and $Q_{kt}$ is the capitation payment for age band $k$ in year $t$. The values of $Q_{kt}$ were obtained for each year from 1997 to 1999 from the Statement of fees and Allowances Payable to General Medical Practitioners in England and Wales (Department of Health 2000a). The relative size of capitation fees for the age bands did not vary over the period. The proportion of the LA population in each age band was obtained for 2000 from the AREA dataset (Sutton et al, 2002)**.**

## 2.5 Estimation

At stage 1 we run separate, annual OLS regressions for GP supply at LA level using LA level variables including the potential instruments (semi-detached house price and age related capitation). Because there is no house price data for three LAs (City of London, Isle of Wight, and the Isles of Scilly) the GP regression uses 351 local authorities.

We estimate the stage 2 health model at the individual level using predicted GP LA level supply as the measure of instrumented GP supply, plus individual covariates, plus all the LA variables in the GP supply model except the instruments.  We drop the 112 individuals in the Health Survey for England who are in the three LAs with no house price data. 49,541 individuals are left in the individual level sample.

We report results from health models using three sets of instruments: age related capitation only (including house prices in the health regression), house prices only (including age related capitation in the health regression), and both instruments.

In the GP supply models we weight each local authority observation by the size of the resident population, and calculate robust standard errors. In the uninstrumented health equation we report standard errors that are adjusted for clustering within local authorities.

In the instrumented health equation the standard errors on predicted GP supply must be corrected to account for the fact that GP supply is an estimate. Karaca-Mandic and Train (2003) note that the Murphy and Topel (1985) estimator is inappropriate when there are differences in the sample sizes in the first and second stage models. We therefore use a bootstrap procedure:

(i)      Draw a sample of 351 local authorities with replacement from the area level dataset.

(ii)     Estimate the GP supply equations for each of the three years 1997, 1998 and 1999.

(iii)    Estimate the individual level health equation using predicted GP supply plus the individual and area level covariates. The individual observations are weighted by the number of times the LA in which an individual lives was drawn in the first stage bootstrap sample.

The reported standard error of the instrumented GP supply coefficient is the standard deviation of the estimated coefficients on GP supply from 200 replications of this procedure. Clustering is unlikely to be a problem in these models because the standard errors are based on bootstrapped coefficients.

We illustrate the magnitude of the effects of GP supply for the categorical health model ($h^1$) from the ordered probit estimates by calculating the effect of 10% increase in GP supply on the probability of each health category:

$$\frac{\partial \Pr(h=m \mid X)}{\partial g}\Delta G = \left[ \frac{\partial \Phi(\mu_m - (\beta \overline{X}))}{\partial g} - \frac{\partial \Phi(\mu_{m-1} - (\beta \overline{X}))}{\partial g} \right] \Delta G \qquad (5)$$

where $m$ is the observed self-reported general health category, the $\mu$'s are the cut points on the underlying latent variable $h^*$, all variables are evaluated at their means, $\Delta G = 0.1\overline{G}$ where $\overline{G}$ is mean GPs per 1000 population, and $g = \ln G$ is the measure of GP supply in the health equation.

For the cardinal health measures ($h^2$, $h^3$) we calculate elasticities with respect to $G$ (measured at the means of the explanatory variables) as $(\partial h / \partial G)\left(\overline{G} / \overline{h}\right) = (\partial h / \partial g)\left(1 / \overline{h}\right) = \beta / \overline{h}$ where $\beta$ is the estimated coefficient on ln G and $\overline{h}$ is mean health

## 2.6 Cost-effectiveness estimates

We can use the results obtained using $h^2$ and $h^3$ to make crude estimates of the cost-effectiveness of increasing GP supply. This is measured over a one-year period as the incremental cost per quality adjusted life year (QALY) gained, which is the preferred measure of cost-effectiveness in both the US (Gold et al, 1996) and the UK (NICE, 2004). We take the perspective of the NHS (i.e. only costs to the NHS are included). All costs are calculated in 1999/2000 UK£.

Estimated at the sample mean of GPs per 1000 population ($\overline{G}$), the incremental cost-effectiveness ratio *ICER* is given by

$$ICER = C / [(\partial h / \partial G) * 1000] = C / [(\partial h / \partial g) / \overline{G}) * 1000] = C / [(\beta / \overline{G}) * 1000] \qquad (6)$$

where $C$ is the annual cost to the NHS of increasing GP supply by one GP, $g = \ln G$, and $\beta$ the estimated effect of $g$ on individual health. As a lower bound estimate of $C$ we use the cost of GP employment in 2003 calculated by Netten and Curtis (2003) which is deflated to 1999/2000 prices using the NHS hospital and community services pay and prices index (Netten and Curtis, 2003) to give a figure of £154,800. The estimate includes net remuneration costs (40% of the total), practice staff costs assuming 0.4 WTE practice nurse and 0.06 WTE other staff per WTE GP (8%), travel costs (2%), other practice expenses (27%), annualised costs of pre- and post-registration training (14%), ongoing training (1%), premises and equipment costs (5%) and overheads (3%).

As an upper bound estimate of $C$ we use mean NHS expenditure per GP. We divide total NHS expenditure in England by the number of GPs in England. In 1999-2000 there were 25,922 whole-time equivalent Unrestricted Principals and Equivalents in England (Department of Health, 2000b). Total NHS expenditure in England in 1999/2000 was £43,746 million (Department of Health, 2003.). This yields NHS expenditure per GP of £1,687,600.

## 3. Results

The full results for the regression models are in the appendix.  Table 1 has WTE GPs per 1,000 patients over the period 1997 to 1999 and shows that there was little variation in GP supply over the three years.

**Table 1. Whole time equivalent GPs per 1,000 residents by local authority, 1997-1999.**

|  | 1997 | 1998 | 1999 |
|---|---|---|---|
| Summary statistics |  |  |  |
| Observations | 354 | 354 | 354 |
| Mean | 0.502 | 0.502 | 0.505 |
| Std. Dev. | 0.041 | 0.040 | 0.037 |
| 1st percentile | 0.426 | 0.434 | 0.436 |
| 5th percentile | 0.447 | 0.447 | 0.456 |
| Median | 0.496 | 0.496 | 0.499 |
| 95th percentile | 0.575 | 0.573 | 0.574 |
| 99th percentile | 0.622 | 0.624 | 0.614 |
| Correlation coefficients |  |  |  |
| 1998 | 0.955* |  |  |
| 1999 | 0.892* | 0.917* |  |

* $p < 0.0001$

Table 2 contains summary statistics for the health variables.  As is usual with self reported health surveys a high proportion (over 75%) of the sample report that they are in good or very good health.

**Table 2. Summary statistics for the health status variables.**

| Self-reported general health | Frequency | % | Mean EQ-5D score |
|---|---|---|---|
| "Very bad" | 657 | 1.33 | 0.214 |
| "Bad" | 2,289 | 4.62 | 0.427 |
| "Fair" | 8,685 | 17.53 | 0.724 |
| "Good" | 20,265 | 40.91 | 0.880 |
| "Very good" | 17,645 | 35.62 | 0.940 |

The number of observations is 49,541.

The results of the first stage least squares *ln* GP supply equations for each year are in Table 3. The full supply models contain 54 local authority level variables measuring deprivation, crime, and hospital supply, as well as eight regional dummy variables. In all years the instruments are individually and jointly significant predictors of *ln* GP supply conditional on the comprehensive set of covariates. As expected, *ln* GP supply is negatively correlated with house prices and positively correlated with the age-related capitation payments.

**Table 3. Impact of the instruments on GP supply measure (ln GPs per 1000 population)**

|  | 1997 | | 1998 | | 1999 | |
|---|---|---|---|---|---|---|
|  | β | t | β | t | β | t |
| Average capitation payment | 0.071 | 3.8 | 0.071 | 3.7 | 0.068 | 3.8 |
| House price index | -0.023 | -3.5 | -0.023 | -3.3 | -0.029 | -4.2 |
| N | 351 |  | 351 |  | 351 |  |
| Adjusted $R^2$ | 0.6298 |  | 0.6010 |  | 0.5143 |  |
| F-test Average capitation payment=0 [p-value] | 14.67 [0.0002] |  | 13.85 [0.0002] |  | 14.21 [0.0002] |  |
| F-test House price index=0 [p-value] | 12.16 [0.0006] |  | 11.17 [0.0009] |  | 17.40 [<0.0001] |  |
| F-test both instruments=0 [p-value] | 12.98 [<0.0001] |  | 12.10 [<0.0001] |  | 15.29 [<0.0001] |  |

Population weights used in all models**.** Fifty-four additional area level covariates are included in each model including deprivation measures, crime rates, hospital supply measures, and eight regional dummy variables.

Table 4 reports the coefficients on instrumented *ln* GP supply from the health regressions, which also contained individual demographic and socio-economic covariates and the 54 area variables from the *ln* GP supply regressions. Twelve sets of coefficients are reported, for the three health measures, and for actual *ln* GP supply and predicted *ln* GP supply using the two instruments separately and jointly.

**Table 4. Impact of GP supply measure (ln GPs per 1000 population) on health**

| Model | Non IV [1] | | IV: house price index[2] | | IV: average capitation payment[3] | | IVs: average capitation payment and house price index[4] | |
|---|---|---|---|---|---|---|---|---|
| | β | β/SE | β | β/SE [5] | β | (/SE 5 | ( | (/SE 5 |
| Health: categorical. Ordered probit regression | 0.232 | 1.6 | 0.758 | 1.5 | 1.614 | 3.5 | 1.179 | 2.6 |
| Health: discrete attributed EQ5D score. Interval regression | 0.031 | 1.3 | 0.146 | 1.8 | 0.272 | 3.6 | 0.205 | 2.8 |
| Health: continuous attributed EQ5D score. Least squares regression | 0.014 | 0.9 | 0.080 | 1.6 | 0.148 | 3.2 | 0.109 | 2.5 |

The number of observations in each model is 49,541.
1 Non-IV. The following individual level covariates are also included but not reported: age; sex; income; social class of head of household; highest educational qualification; ethnic group; marital status; housing tenure; number of cars owned by household; month of interview; proxy respondent; year of survey; missing item dummy variables. Fifty four area level covariates are also included, comprising deprivation measures, crime rates, hospital supply measures, and eight Government Office Region dummy variables.  SE corrected for clustering in local authorities.
2 The covariates are as for the non IV models, plus age capitation payments.
3 The covariates are as for the non IV models, plus the mean semi-detached house price/100,000.
4 The covariates are as for the non IV models.
5 The standard error is the standard deviation of the coefficient from 200 replications.

In all cases *ln* GP supply has a positive impact on health status. Compared with the non-IV models, the IV models have a much greater impact of *ln* GP supply on health. In the models where the house price index is only instrument,  *ln* GP supply is not significant at the 5% level.  The effect of *ln* GP supply is greatest, and has the highest statistical significance, when age related capitation payments are used as the instrument.  Using age related capitation as the only instrument increases the estimated effect of *ln* GP supply ten-fold compared with the uninstrumented estimate.

Table 5 reports the change in the probability of reporting each self reported general health category following a 10% increase in GPs per 1000, calculated from the ordered probit regressions. In each model an increase in GP supply leads to a reduced probability of reporting very bad, bad, fair or good health, and an increased probability of reporting very good health.

**Table 5. Effect of 10% increase in GPs per 1000 on probabilities of self reported health categories.**

| | Self reported general health category | | | | |
|---|---|---|---|---|---|
| | Very bad | Bad | Fair | Good | Very good |
| Observed probability of category | 0.013 | 0.046 | 0.175 | 0.409 | 0.356 |
| Model | | | | | |
| No IV | 0.000 | -0.002 | -0.005 | -0.002 | 0.008 |
| IV: house price index | -0.001 | -0.005 | -0.016 | -0.006 | 0.028 |
| IV: average capitation payment | -0.003 | -0.011 | -0.033 | -0.012 | 0.059 |
| IVs: average capitation payment & house price index | -0.002 | -0.008 | -0.024 | -0.009 | 0.043 |

The elasticity of the EQ-5D health status measure with respect to changes in GPs per 1000 population, as calculated from the interval regression and OLS models, is reported in Table 6. For the IV models a 10% increase in GP supply would increase health status by 0.95%-3.28% depending on the IV and health status measure.

**Table 6. Elasticity of health with respect to GPs per 1000 population**

| Model | $\beta$ | $\overline{h}$ | Elasticity ( $\beta / \overline{h}$ ) |
|---|---|---|---|
| *Health measure: discrete attributed EQ5D* | | | |
| No IV | 0.031 | 0.830 | 0.037 |
| IV: house price index | 0.146 | 0.830 | 0.176 |
| IV: average capitation payment | 0.272 | 0.830 | 0.328 |
| IVs: average capitation payment and house price index | 0.205 | 0.830 | 0.247 |
| *Health measure: continuous attributed EQ5D* | | | |
| No IV | 0.014 | 0.844 | 0.017 |
| IV: house price index | 0.080 | 0.844 | 0.095 |
| IV: average capitation payment | 0.148 | 0.844 | 0.175 |
| IVs: average capitation payment and house price index | 0.109 | 0.844 | 0.129 |

$\beta$ estimated coefficient on log GP per head of population (*g*). $\overline{h}$ : estimated mean EQ-5D score; elasticity with respect to GPs per 1000 population (*G*) = $(\partial h / \partial G)\left(G / \overline{h}\right)$ = $\beta / \overline{h}$

The results of the cost-effectiveness analysis are in Table 7. Column (1) has the coefficient ($\beta$) on *ln* GP supply from the OLS and interval regression models. Column (2) reports the mean value of the GPs per 1000 population for the HSE sample. Column (3) is the marginal effect of GP supply on health ($\partial h / \partial G = \beta / \overline{G}$ ). This is the change in EQ-5D score per patient following an increase in WTE GPs per 1,000 patients by one unit. Over the 1,000 patients the total EQ-5D score gained from an additional WTE GP is in column (4). Dividing the mean costs from an increase in GP supply (in columns (5) or (6)) by the QALYs gained (column (4)) gives the incremental cost per QALY gained, shown in column (7) and (8).

**Table 7. Cost per QALY gained from increase in GPs per 1000 population.**

| Model | (1) $\beta$ | (2) $\overline{G}$ | (3) $\partial h / \partial G$ | (4) QALYs gained | (5) $C_L$ | (6) $C_U$ | (7) $ICER_L$ | (8) $ICER_U$ |
|---|---|---|---|---|---|---|---|---|
| *Health: discrete attributed EQ5D* | | | | | | | | |
| No IV | 0.031 | 0.5 | 0.062 | 62 | 154,800 | 1,687,600 | 2,497 | 27,219 |
| IV: house price index | 0.146 | 0.5 | 0.290 | 290 | 154,800 | 1,687,600 | 534 | 5,819 |
| IV average capitation payment | 0.272 | 0.5 | 0.541 | 541 | 154,800 | 1,687,600 | 286 | 3,119 |
| IVs: average capitation payment & house price index | 0.205 | 0.5 | 0.408 | 408 | 154,800 | 1,687,600 | 379 | 4,136 |
| *Health: continuous attributed EQ5D* | | | | | | | | |
| No IV | 0.014 | 0.5 | 0.028 | 28 | 154,800 | 1,687,600 | 5,529 | 60,271 |
| IV: house price index | 0.080 | 0.5 | 0.159 | 159 | 154,800 | 1,687,600 | 974 | 10,614 |
| IV average capitation payment | 0.148 | 0.5 | 0.294 | 294 | 154,800 | 1,687,600 | 527 | 5,740 |
| IVs: average capitation payment & house price index | 0.109 | 0.5 | 0.217 | 217 | 154,800 | 1,687,600 | 713 | 7,777 |

$\beta$ estimated effect on health of log GPs per 1000 patients; $\overline{G}$ mean GPs per 1000 population; QALY gain per individual from 1 unit increase in GP supply: $\partial h / \partial G = \beta / \overline{G}$ ; $C_L$, $C_U$ lower and upper bound estimates of annual cost of an GP; ICER = C/QALYs gained. All costs are 1999 £s.

Using the lower costs estimates (column (7)), the incremental cost per QALY is £2497 to £5529 using non-IV methods, and £286 to £974 in the IV models. Using the upper cost estimates (column (8)) the figures are £27,219 to 60271 and £3119 to £10614 respectively.

## 4. Conclusion

Using a multi-level data set with rich information on individuals and areas we find that area GP supply is positively associated with individual self assessed health. However, if no allowance is made for the endogeneity of GP supply, the effect is not statistically significant.  Using instruments (house prices and age related capitation per head of population) for GP supply yields markedly larger estimates which are statistically significant when the instrument is age related capitation.  When GP supply is instrumented by age related capitation a 10% increase in GP supply increases the proportion of the population reporting very good health by 6% and increases the continuous attributed EQ5D score by 1.8%.  The results are robust to alternative estimation methods for the health model (ordered probit, least squares and interval regression).

Using our preferred capitation payment IV the incremental NHS cost per QALY gained from an additional GP ranges from £527   to £5740 depending on the assumptions about the health service cost an additional GP. The National Institute for Clinical Excellence (NICE) was established in 1999 to provide national guidance on the effectiveness and cost effectiveness of new health technologies in the NHS. Towse (2002) has suggested that the threshold cost per QALY gained implicit in NICE's decisions is between £20,000 and £30,000 though statistical analysis by Devlin and Parkin (2004), implies that the threshold is somewhat greater. Even with a conservative threshold of £20,000 per QALY gained, our estimates suggest that increasing the supply of GPs is cost-effective by NICE standards.

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**Appendix**
**Table A1.  Summary statistics**

|  | Mean | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|
| **Local authority level variables (observations = 351)** [1] |  |  |  |  |
| Mean semi-detached house price/100,000 | 0.977 | 0.773 | 0.397 | 8.951 |
| Mean age-related capitation payment, 1997 | 18.418 | 0.527 | 17.389 | 20.717 |
| Mean age-related capitation payment, 1998 | 18.707 | 0.535 | 17.661 | 21.044 |
| Mean age-related capitation payment, 1999 | 20.245 | 0.578 | 19.117 | 22.768 |
| Violent offences, rate per 1,000 population, 2000 | 9.564 | 5.975 | 2.000 | 36.600 |
| Sexual offences, rate per 1,000 population, 2000 | 0.614 | 0.355 | 0.100 | 2.200 |
| Robbery, rate per 1,000 population, 2000 | 1.202 | 2.061 | 0.000 | 17.200 |
| Burglary from a dwelling, rate per 1,000 households, 2000 | 15.091 | 9.261 | 3.000 | 52.900 |
| Theft of a motor vehicle, rate per 1,000 population, 2000 | 5.075 | 3.427 | 0.900 | 20.900 |
| Theft from a motor vehicle, rate per 1,000 population, 2000 | 10.616 | 5.438 | 2.100 | 40.300 |
| Index of deprivation score | 22.476 | 11.425 | 4.427 | 61.303 |
| Income domain score | 19.794 | 7.953 | 6.122 | 51.268 |
| Employment domain score | 10.520 | 5.016 | 2.632 | 28.285 |
| Education domain score | 0.076 | 0.572 | -1.529 | 1.543 |
| Housing domain score | 0.058 | 0.624 | -1.169 | 2.407 |
| Child poverty domain score | 28.244 | 11.285 | 9.195 | 73.637 |
| Job seekers' allowance, benefits in payment | 3.726 | 2.406 | 0.609 | 14.697 |
| Percentage aged 17 or over not going to Higher Education | 84.190 | 4.571 | 66.942 | 93.511 |
| Standardised incapacity benefit/severe disability allowance claimants | 86.035 | 41.528 | 23.199 | 304.324 |
| Standardised attendance allowance/severe disability allowance claimants | 83.862 | 30.272 | 39.741 | 229.747 |
| Attendance allowance claimants over 60 years | 0.096 | 0.021 | 0.056 | 0.188 |
| Income support claimants over 60 years | 0.131 | 0.047 | 0.058 | 0.352 |
| Proportion attendance allowance/severe disability allowance claimants | 5.038 | 1.704 | 2.209 | 12.514 |
| Proportion incapacity benefit/severe disability allowance claimants | 5.644 | 2.619 | 1.588 | 19.965 |
| Mean beds at acute providers used | 796.539 | 287.013 | 369.269 | 2293.782 |
| Mean distance to acute providers used | 27.205 | 11.544 | 11.931 | 90.330 |
| Mean number of consultants at acute providers used | 125.334 | 49.006 | 59.047 | 346.950 |
| Mean number of staff at acute providers used | 352.503 | 139.516 | 140.308 | 993.434 |
| Mean proportion outpatients seen < 4 weeks at providers used | 0.345 | 0.045 | 0.230 | 0.488 |
| Mean proportion outpatients seen < 13 weeks at providers used | 0.770 | 0.045 | 0.627 | 0.897 |
| Mean proportion outpatients seen < 26 weeks at providers used | 0.942 | 0.023 | 0.857 | 0.989 |
| Mean proportion inpatients seen < 3 months at providers used | 0.520 | 0.078 | 0.350 | 0.808 |
| Mean proportion inpatients seen < 6 months at providers used | 0.749 | 0.062 | 0.578 | 0.964 |
| Mean proportion inpatients seen < 12 months at providers used | 0.955 | 0.023 | 0.871 | 0.996 |
| Mean waiting time for elective admissions | 93.004 | 20.265 | 51.511 | 159.855 |
| Median waiting time for elective admissions | 43.235 | 11.616 | 16.076 | 85.026 |
| Mean number waiting for elective admissions | 637.505 | 364.100 | 116.378 | 2217.714 |
| Accessibility score for acute beds | 0.00244 | 0.00075 | 0.00040 | 0.00435 |
| Accessibility score for mental health beds | 0.00074 | 0.00026 | 0.00011 | 0.00151 |
| Accessibility score for maternity beds | 0.00018 | 0.00006 | 0.00003 | 0.00032 |
| Accessibility score for private beds | 0.00030 | 0.00018 | 0.00003 | 0.00107 |
| Mean waiting time at 5 nearest acute providers | 91.452 | 16.676 | 54.661 | 145.668 |
| Mean distance to 5 nearest acute providers | 29.181 | 11.978 | 12.336 | 97.878 |
| Mean beds at 5 nearest acute providers | 498.800 | 132.431 | 214.509 | 948.796 |

| | | | | |
|---|---|---|---|---|
| Mean distance to 5 nearest mental health providers | 34.528 | 14.723 | 12.754 | 120.521 |
| Mean beds at 5 nearest mental health providers | 239.257 | 83.279 | 93.256 | 541.446 |
| Mean distance to 5 nearest maternity providers | 33.807 | 13.607 | 13.414 | 106.512 |
| Mean beds at 5 nearest maternity providers | 55.761 | 10.241 | 32.399 | 100.239 |
| Mean distance to 5 nearest private providers | 26.577 | 11.243 | 11.400 | 91.089 |
| Mean beds at 5 nearest private providers | 38.949 | 15.331 | 14.800 | 113.611 |
| East Government Office Region | 0.137 | 0.344 | 0.000 | 1.000 |
| East Midlands Government Office Region | 0.114 | 0.318 | 0.000 | 1.000 |
| North East Government Office Region | 0.066 | 0.248 | 0.000 | 1.000 |
| North West Government Office Region | 0.123 | 0.328 | 0.000 | 1.000 |
| South East Government Office Region | 0.188 | 0.391 | 0.000 | 1.000 |
| South West Government Office Region | 0.125 | 0.332 | 0.000 | 1.000 |
| West Midlands Government Office Region | 0.097 | 0.296 | 0.000 | 1.000 |
| Yorkshire and Humberside Government Office Region | 0.060 | 0.238 | 0.000 | 1.000 |
| London Government Office Region | 0.091 | 0.288 | 0.000 | 1.000 |
| **Individual level variables (observations = 49,541)** | | | | |
| Age/100 | 0.387 | 0.234 | 0.020 | 1.020 |
| Female | 0.536 | 0.499 | 0.000 | 1.000 |
| Income/100,000 | 0.196 | 0.181 | 0.000 | 2.997 |
| Missing | 0.189 | 0.392 | 0.000 | 1.000 |
| *Social class of head of household* | | | | |
| I Professional | 0.062 | 0.240 | 0.000 | 1.000 |
| II Managerial/technical | 0.270 | 0.444 | 0.000 | 1.000 |
| IIIN Skilled non-manual | 0.128 | 0.334 | 0.000 | 1.000 |
| IIIM Skilled manual | 0.274 | 0.446 | 0.000 | 1.000 |
| IV Semi-skilled manual | 0.156 | 0.362 | 0.000 | 1.000 |
| V Unskilled manual | 0.046 | 0.208 | 0.000 | 1.000 |
| Other | 0.039 | 0.194 | 0.000 | 1.000 |
| Missing | 0.026 | 0.159 | 0.000 | 1.000 |
| *Highest qualification* | | | | |
| Degree | 0.103 | 0.304 | 0.000 | 1.000 |
| Higher education less than a degree | 0.079 | 0.270 | 0.000 | 1.000 |
| A level or equivalent | 0.082 | 0.274 | 0.000 | 1.000 |
| GCSE or equivalent | 0.175 | 0.380 | 0.000 | 1.000 |
| CSE or equivalent | 0.039 | 0.194 | 0.000 | 1.000 |
| Other qualification | 0.036 | 0.185 | 0.000 | 1.000 |
| No qualification | 0.269 | 0.443 | 0.000 | 1.000 |
| Missing | 0.217 | 0.412 | 0.000 | 1.000 |
| ***Ethnic group*** | | | | |
| White | 0.781 | 0.414 | 0.000 | 1.000 |
| Black Caribbean | 0.037 | 0.188 | 0.000 | 1.000 |
| Black African | 0.006 | 0.080 | 0.000 | 1.000 |
| Black Other | 0.005 | 0.073 | 0.000 | 1.000 |
| Indian | 0.044 | 0.206 | 0.000 | 1.000 |
| Pakistani | 0.046 | 0.210 | 0.000 | 1.000 |
| Bangladeshi | 0.040 | 0.195 | 0.000 | 1.000 |
| Chinese | 0.019 | 0.136 | 0.000 | 1.000 |

| | | | | |
|---|---|---|---|---|
| Other non-white ethnic group | 0.021 | 0.142 | 0.000 | 1.000 |
| Missing | 0.002 | 0.041 | 0.000 | 1.000 |
| ***Marital status*** | | | | |
| Single | 0.193 | 0.394 | 0.000 | 1.000 |
| Married | 0.434 | 0.496 | 0.000 | 1.000 |
| Separated | 0.021 | 0.143 | 0.000 | 1.000 |
| Divorced | 0.053 | 0.225 | 0.000 | 1.000 |
| Widowed | 0.060 | 0.238 | 0.000 | 1.000 |
| Missing | 0.239 | 0.427 | 0.000 | 1.000 |
| *Housing tenure* | | | | |
| Own outright | 0.215 | 0.411 | 0.000 | 1.000 |
| Buying with a mortgage | 0.462 | 0.499 | 0.000 | 1.000 |
| Part rent part mortgage | 0.006 | 0.077 | 0.000 | 1.000 |
| Rent | 0.280 | 0.449 | 0.000 | 1.000 |
| Live rent-free | 0.010 | 0.097 | 0.000 | 1.000 |
| Missing | 0.027 | 0.162 | 0.000 | 1.000 |
| *Number of cars owned by household* | | | | |
| 0 | 0.219 | 0.413 | 0.000 | 1.000 |
| 1 | 0.445 | 0.497 | 0.000 | 1.000 |
| 2 | 0.260 | 0.439 | 0.000 | 1.000 |
| 3 or more | 0.051 | 0.220 | 0.000 | 1.000 |
| Missing | 0.025 | 0.156 | 0.000 | 1.000 |
| *Month of interview* | | | | |
| January | 0.084 | 0.278 | 0.000 | 1.000 |
| February | 0.090 | 0.286 | 0.000 | 1.000 |
| March | 0.092 | 0.289 | 0.000 | 1.000 |
| April | 0.080 | 0.272 | 0.000 | 1.000 |
| May | 0.088 | 0.283 | 0.000 | 1.000 |
| June | 0.081 | 0.273 | 0.000 | 1.000 |
| July | 0.085 | 0.279 | 0.000 | 1.000 |
| August | 0.085 | 0.279 | 0.000 | 1.000 |
| September | 0.090 | 0.287 | 0.000 | 1.000 |
| October | 0.088 | 0.283 | 0.000 | 1.000 |
| November | 0.091 | 0.288 | 0.000 | 1.000 |
| December | 0.045 | 0.207 | 0.000 | 1.000 |
| Proxy respondent | 0.173 | 0.378 | 0.000 | 1.000 |
| *Year* | | | | |
| 1998 | 0.395 | 0.489 | 0.000 | 1.000 |
| 1999 | 0.381 | 0.486 | 0.000 | 1.000 |
| 2000 | 0.224 | 0.417 | 0.000 | 1.000 |

Notes
1 Population-weighted.

**Table A2. Full results for GP supply equations**

|  | 1997 |  | 1998 |  | 1999 |  |
|---|---|---|---|---|---|---|
|  | β | t | β | t | β | t |
| Mean age-related capitation payment | 0.071 | 3.8 | 0.071 | 3.7 | 0.068 | 3.8 |
| Mean semi-detached house price/100,000 | -0.023 | -3.5 | -0.023 | -3.3 | -0.029 | -4.2 |
| Violent offences, rate per 1,000 population, 2000 | -0.002 | -1.2 | 0.000 | -0.3 | -0.001 | -0.4 |
| Sexual offences, rate per 1,000 population, 2000 | 0.047 | 2.5 | 0.037 | 1.9 | 0.035 | 1.8 |
| Robbery, rate per 1,000 population, 2000 | -0.003 | -1.0 | 0.001 | 0.2 | 0.003 | 0.8 |
| Burglary from a dwelling, rate per 1,000 households, 2000 | 0.000 | -0.6 | -0.001 | -0.9 | 0.000 | -0.6 |
| Theft of a motor vehicle, rate per 1,000 population, 2000 | -0.001 | -0.4 | -0.001 | -0.6 | -0.002 | -1.3 |
| Theft from a motor vehicle, rate per 1,000 population, 2000 | 0.001 | 0.5 | 0.000 | 0.2 | 0.001 | 0.9 |
| Index of deprivation score | 0.013 | 3.2 | 0.014 | 3.4 | 0.010 | 2.5 |
| Income domain score | -0.011 | -2.3 | -0.012 | -2.4 | -0.011 | -2.2 |
| Employment domain score | -0.001 | -0.1 | 0.001 | 0.1 | 0.002 | 0.1 |
| Education domain score | -0.037 | -2.0 | -0.041 | -2.1 | -0.043 | -2.2 |
| Housing domain score | -0.005 | -0.4 | -0.007 | -0.5 | 0.014 | 1.0 |
| Child poverty domain score | 0.000 | -0.2 | 0.001 | 0.3 | 0.001 | 0.4 |
| Job seekers' allowance, benefits in payment | -0.001 | 0.0 | -0.008 | -0.6 | -0.005 | -0.4 |
| Percentage aged 17 or over not going to Higher Education | -0.002 | -1.3 | -0.003 | -1.7 | -0.002 | -1.3 |
| Standardised incapacity benefit/severe disability allowance | 0.001 | 0.6 | 0.001 | 0.4 | -0.001 | -0.4 |
| Standardised attendance allowance/severe disability allowance | 0.000 | 0.2 | 0.001 | 0.6 | 0.001 | 0.7 |
| Attendance allowance claimants over 60 years | 1.023 | 2.3 | 1.094 | 2.4 | 1.268 | 2.7 |
| Income support claimants over 60 years | 0.100 | 0.4 | -0.120 | -0.4 | 0.085 | 0.3 |
| Proportion attendance allowance/severe disability allowance | -0.033 | -1.4 | -0.045 | -1.8 | -0.049 | -2.0 |
| Proportion incapacity benefit/severe disability allowance | -0.029 | -0.9 | -0.027 | -0.8 | 0.005 | 0.1 |
| Mean beds at acute providers used | 0.000 | -1.7 | 0.000 | -1.5 | 0.000 | -1.2 |
| Mean distance to acute providers used | 0.001 | 0.8 | 0.001 | 1.6 | 0.001 | 1.3 |
| Mean number of consultants at acute providers used | 0.000 | 0.8 | 0.000 | 0.0 | 0.000 | 0.7 |
| Mean number of staff at acute providers used | 0.000 | 0.3 | 0.000 | 0.7 | 0.000 | 0.1 |
| Mean proportion outpatients seen < 4 weeks at providers used | -0.068 | -0.7 | -0.057 | -0.6 | -0.046 | -0.4 |
| Mean proportion outpatients seen < 13 weeks at providers used | 0.529 | 3.2 | 0.511 | 3.0 | 0.565 | 3.3 |
| Mean proportion outpatients seen < 26 weeks at providers used | -1.032 | -3.8 | -1.063 | -3.7 | -1.067 | -3.7 |
| Mean proportion inpatients seen < 3 months at providers used | -0.137 | -0.9 | -0.232 | -1.4 | -0.310 | -1.9 |
| Mean proportion inpatients seen < 6 months at providers used | 0.102 | 0.4 | 0.132 | 0.5 | 0.453 | 1.6 |
| Mean proportion inpatients seen < 12 months at providers used | 0.220 | 0.7 | 0.392 | 1.1 | 0.198 | 0.6 |
| Mean waiting time for elective admissions | 0.000 | -1.0 | -0.001 | -1.2 | 0.000 | 0.1 |
| Median waiting time for elective admissions | 0.001 | 1.0 | 0.001 | 1.2 | 0.000 | 0.1 |
| Mean number waiting for elective admissions | 0.000 | -0.4 | 0.000 | -0.3 | 0.000 | -1.2 |
| Accessibility score for acute beds | 81.145 | 4.0 | 93.372 | 4.4 | 76.466 | 3.6 |
| Accessibility score for mental health beds | -37.934 | -1.4 | -31.583 | -1.2 | -39.834 | -1.4 |
| Accessibility score for maternity beds | -746.58 | -3.2 | -835.33 | -3.4 | -696.87 | -2.8 |
| Accessibility score for private beds | 6.855 | 0.1 | -2.229 | 0.0 | 20.252 | 0.3 |
| Mean waiting time at 5 nearest acute providers | -0.001 | -1.9 | -0.001 | -1.5 | -0.001 | -1.3 |
| Mean distance to 5 nearest acute providers | 0.006 | 3.5 | 0.005 | 2.9 | 0.004 | 2.3 |
| Mean beds at 5 nearest acute providers | 0.000 | -2.6 | 0.000 | -2.5 | 0.000 | -2.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Mean distance to 5 nearest mental health providers | -0.002 | -2.1 | -0.002 | -1.7 | -0.001 | -1.3 |
| Mean beds at 5 nearest mental health providers | 0.000 | 2.7 | 0.000 | 2.5 | 0.000 | 2.3 |
| Mean distance to 5 nearest maternity providers | -0.001 | -0.8 | -0.001 | -0.5 | 0.000 | -0.2 |
| Mean beds at 5 nearest maternity providers | 0.001 | 1.4 | 0.001 | 1.7 | 0.000 | 1.0 |
| Mean distance to 5 nearest private providers | 0.001 | 1.1 | 0.000 | 0.5 | 0.000 | 0.4 |
| Mean beds at 5 nearest private providers | 0.000 | -0.2 | 0.000 | -0.3 | 0.000 | -0.7 |
| East Government Office Region | 0.063 | 2.9 | 0.073 | 3.3 | 0.028 | 1.2 |
| East Midlands Government Office Region | 0.006 | 0.3 | 0.017 | 0.7 | -0.021 | -0.9 |
| North East Government Office Region | 0.058 | 1.8 | 0.080 | 2.3 | 0.056 | 1.6 |
| North West Government Office Region | 0.065 | 2.5 | 0.074 | 2.8 | 0.043 | 1.6 |
| South East Government Office Region | 0.051 | 2.5 | 0.061 | 2.8 | 0.007 | 0.4 |
| South West Government Office Region | 0.085 | 3.6 | 0.099 | 4.0 | 0.038 | 1.5 |
| West Midlands Government Office Region | 0.044 | 1.9 | 0.056 | 2.3 | -0.002 | -0.1 |
| Yorkshire and Humberside Government Office Region | 0.054 | 2.0 | 0.081 | 2.9 | 0.032 | 1.1 |
| Constant | -1.507 | -3.2 | -1.597 | -3.2 | -1.696 | -3.4 |
| N | 351 | | 351 | | 351 | |
| $R^2$ | 0.6890 | | 0.6649 | | 0.5920 | |

Notes
Population weights are used in all models

**Table A3. Impact of GP supply on self reported general health. Regression model = ordered probit.**

| | Non-IV [1] | | IV-1 [2] | | IV-2 [3] | | IV-3 [4] | |
|---|---|---|---|---|---|---|---|---|
| | β | β/SE | β | β/SE | ( | (/SE | ( | (/SE |
| ln(WTE GPs per 1,000 patients) 5 | 0.232 | 1.6 | 0.758 | 1.5 | 1.614 | 3.5 | 1.179 | 2.6 |
| Age/100 | 2.646 | 5.9 | 2.633 | 5.9 | 2.624 | 5.9 | 2.631 | 5.9 |
| Age/100 squared | -10.575 | -10.5 | -10.534 | -10.4 | -10.518 | -10.4 | -10.534 | -10.4 |
| Age/100 cubed | 7.708 | 10.6 | 7.671 | 10.5 | 7.663 | 10.5 | 7.675 | 10.5 |
| Female | 0.125 | 3.0 | 0.124 | 3.0 | 0.124 | 3.0 | 0.124 | 3.0 |
| Female*Age/100 | -1.903 | -4.7 | -1.888 | -4.6 | -1.889 | -4.7 | -1.892 | -4.7 |
| Female*Age/100 squared | 4.819 | 4.6 | 4.774 | 4.6 | 4.781 | 4.6 | 4.789 | 4.6 |
| Female*Age/100 cubed | -3.138 | -4.1 | -3.103 | -4.0 | -3.109 | -4.0 | -3.116 | -4.0 |
| Income/100,000 | 0.387 | 8.5 | 0.388 | 8.5 | 0.386 | 8.5 | 0.387 | 8.5 |
| Missing | -0.005 | -0.3 | -0.005 | -0.3 | -0.005 | -0.3 | -0.005 | -0.3 |
| **Social class of head of household [a]** | | | | | | | | |
| II Managerial/technical | -0.020 | -0.7 | -0.022 | -0.8 | -0.021 | -0.7 | -0.021 | -0.7 |
| IIIN Skilled non-manual | -0.033 | -1.0 | -0.035 | -1.1 | -0.034 | -1.1 | -0.034 | -1.1 |
| IIIM Skilled manual | -0.129 | -3.9 | -0.131 | -4.0 | -0.130 | -3.9 | -0.130 | -3.9 |
| IV Semi-skilled manual | -0.147 | -4.6 | -0.148 | -4.6 | -0.148 | -4.6 | -0.147 | -4.6 |
| V Unskilled manual | -0.200 | -5.0 | -0.203 | -5.0 | -0.202 | -5.0 | -0.202 | -5.0 |
| Other | -0.151 | -3.8 | -0.152 | -3.8 | -0.152 | -3.8 | -0.151 | -3.8 |
| Missing | -0.033 | -0.3 | -0.031 | -0.2 | -0.028 | -0.2 | -0.027 | -0.2 |
| **Highest educational qualification [b]** | | | | | | | | |
| Higher education less than a degree | -0.112 | -4.7 | -0.112 | -4.6 | -0.111 | -4.6 | -0.111 | -4.6 |
| A level or equivalent | -0.079 | -3.3 | -0.077 | -3.2 | -0.077 | -3.2 | -0.078 | -3.2 |
| GCSE or equivalent | -0.135 | -6.1 | -0.135 | -6.1 | -0.134 | -6.1 | -0.134 | -6.1 |
| CSE or equivalent | -0.259 | -8.6 | -0.257 | -8.5 | -0.257 | -8.5 | -0.257 | -8.5 |
| Other qualification | -0.169 | -5.1 | -0.168 | -5.1 | -0.168 | -5.1 | -0.168 | -5.1 |
| No qualification | -0.376 | -15.9 | -0.376 | -15.9 | -0.375 | -15.9 | -0.375 | -15.9 |
| Missing | -0.038 | -0.4 | -0.035 | -0.4 | -0.034 | -0.4 | -0.034 | -0.4 |
| **Ethnic group [c]** | | | | | | | | |
| Black Caribbean | -0.084 | -2.4 | -0.083 | -2.3 | -0.080 | -2.2 | -0.083 | -2.3 |
| Black African | 0.014 | 0.2 | 0.009 | 0.1 | 0.007 | 0.1 | 0.006 | 0.1 |
| Black Other | -0.232 | -3.9 | -0.234 | -4.0 | -0.230 | -3.9 | -0.234 | -3.9 |
| Indian | -0.326 | -10.0 | -0.329 | -10.1 | -0.327 | -10.0 | -0.329 | -10.1 |
| Pakistani | -0.287 | -7.8 | -0.288 | -7.9 | -0.289 | -8.0 | -0.287 | -7.9 |
| Bangladeshi | -0.375 | -7.0 | -0.369 | -7.0 | -0.372 | -7.0 | -0.368 | -7.0 |
| Chinese | -0.239 | -3.9 | -0.240 | -3.9 | -0.235 | -3.8 | -0.236 | -3.8 |
| Other non-white ethnic group | -0.102 | -2.5 | -0.103 | -2.5 | -0.103 | -2.5 | -0.104 | -2.5 |
| Missing | -0.385 | -3.0 | -0.389 | -3.0 | -0.393 | -3.0 | -0.390 | -3.0 |
| **Marital status [d]** | | | | | | | | |
| Married | 0.057 | 2.9 | 0.057 | 2.9 | 0.056 | 2.9 | 0.057 | 2.9 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Separated | 0.015 | 0.4 | 0.014 | 0.4 | 0.015 | 0.4 | 0.015 | 0.4 |
| Divorced | -0.030 | -1.1 | -0.030 | -1.0 | -0.030 | -1.1 | -0.030 | -1.1 |
| Widowed | 0.087 | 2.6 | 0.087 | 2.6 | 0.087 | 2.6 | 0.087 | 2.6 |
| Missing | 0.075 | 0.8 | 0.073 | 0.7 | 0.071 | 0.7 | 0.072 | 0.7 |
| **Housing tenure [e]** | | | | | | | | |
| Mortgage | -0.037 | -1.9 | -0.036 | -1.8 | -0.036 | -1.8 | -0.037 | -1.9 |
| Part mortgage part rent | -0.293 | -3.4 | -0.293 | -3.4 | -0.291 | -3.4 | -0.290 | -3.4 |
| Rent | -0.234 | -10.1 | -0.232 | -10.0 | -0.232 | -10.0 | -0.233 | -10.0 |
| Living rent free | -0.022 | -0.3 | -0.021 | -0.3 | -0.021 | -0.3 | -0.020 | -0.3 |
| Missing | -0.173 | -1.5 | -0.173 | -1.5 | -0.173 | -1.5 | -0.173 | -1.5 |
| **Cars owned by household [f]** | | | | | | | | |
| 1 | 0.109 | 5.4 | 0.108 | 5.4 | 0.109 | 5.4 | 0.108 | 5.4 |
| 2 | 0.169 | 7.7 | 0.168 | 7.7 | 0.169 | 7.7 | 0.168 | 7.7 |
| 3 or more | 0.137 | 4.0 | 0.136 | 4.0 | 0.137 | 4.0 | 0.136 | 4.0 |
| Missing | -0.010 | -0.1 | -0.010 | -0.1 | -0.007 | 0.0 | -0.010 | -0.1 |
| **Month of interview [g]** | | | | | | | | |
| February | -0.028 | -0.9 | -0.026 | -0.9 | -0.026 | -0.9 | -0.026 | -0.9 |
| March | -0.029 | -1.0 | -0.027 | -0.9 | -0.026 | -0.9 | -0.028 | -0.9 |
| April | -0.020 | -0.6 | -0.020 | -0.6 | -0.020 | -0.6 | -0.020 | -0.6 |
| May | -0.019 | -0.6 | -0.017 | -0.5 | -0.019 | -0.6 | -0.017 | -0.5 |
| June | 0.018 | 0.5 | 0.021 | 0.6 | 0.021 | 0.6 | 0.021 | 0.6 |
| July | 0.016 | 0.5 | 0.015 | 0.4 | 0.015 | 0.4 | 0.015 | 0.5 |
| August | 0.021 | 0.7 | 0.022 | 0.7 | 0.022 | 0.7 | 0.021 | 0.7 |
| September | 0.026 | 0.9 | 0.028 | 0.9 | 0.028 | 0.9 | 0.028 | 0.9 |
| October | 0.028 | 0.9 | 0.030 | 0.9 | 0.030 | 0.9 | 0.030 | 0.9 |
| November | -0.003 | -0.1 | -0.002 | -0.1 | -0.002 | -0.1 | -0.002 | -0.1 |
| December | 0.042 | 1.1 | 0.044 | 1.1 | 0.043 | 1.1 | 0.043 | 1.1 |
| Proxy respondent | 0.151 | 3.9 | 0.151 | 3.9 | 0.151 | 3.9 | 0.151 | 3.9 |
| **Year [h]** | | | | | | | | |
| 1999 | 0.012 | 0.7 | -0.017 | -0.8 | 0.011 | 0.6 | 0.011 | 0.7 |
| 2000 | -0.003 | -0.2 | -0.188 | -2.0 | -0.012 | -0.6 | -0.009 | -0.5 |
| ***Local authority level variables*** | | | | | | | | |
| Violent offences, rate per 1,000 population, 2000 | 0.002 | 0.7 | 0.003 | 0.8 | 0.003 | 0.9 | 0.004 | 1.1 |
| Sexual offences, rate per 1,000 population, 2000 | 0.041 | 0.9 | 0.049 | 1.0 | 0.006 | 0.1 | 0.020 | 0.4 |
| Robbery, rate per 1,000 population, 2000 | 0.000 | 0.1 | -0.002 | -0.3 | -0.001 | -0.2 | 0.000 | -0.1 |
| Burglary from a dwelling, rate per 1,000 households, 2000 | -0.001 | -0.6 | 0.000 | -0.1 | 0.000 | 0.1 | 0.000 | -0.2 |
| Theft of a motor vehicle, rate per 1,000 population, 2000 | -0.002 | -0.6 | -0.003 | -0.6 | -0.001 | -0.3 | -0.003 | -0.6 |
| Theft from a motor vehicle, rate per 1,000 population, 2000 | 0.000 | 0.1 | 0.000 | -0.1 | -0.001 | -0.4 | 0.000 | 0.0 |
| Index of deprivation score | -0.024 | -2.0 | -0.036 | -2.7 | -0.045 | -3.3 | -0.040 | -2.9 |
| Income domain score | 0.016 | 1.3 | 0.019 | 1.4 | 0.030 | 2.2 | 0.023 | 1.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Employment domain score | -0.020 | -0.6 | -0.004 | -0.1 | -0.010 | -0.3 | -0.013 | -0.4 |
| Education domain score | 0.046 | 0.9 | 0.078 | 1.5 | 0.106 | 2.0 | 0.091 | 1.7 |
| Housing domain score | 0.047 | 1.4 | 0.069 | 2.1 | 0.062 | 1.9 | 0.060 | 1.8 |
| Child poverty domain score | -0.005 | -1.0 | -0.005 | -1.0 | -0.006 | -1.1 | -0.005 | -0.9 |
| Job seekers' allowance, benefits in payment | 0.050 | 1.8 | 0.046 | 1.6 | 0.051 | 1.8 | 0.053 | 1.9 |
| Percentage aged 17 or over not going to Higher Education | 0.004 | 1.0 | 0.005 | 1.3 | 0.008 | 1.9 | 0.005 | 1.3 |
| Standardised incapacity benefit/severe disability allowance | 0.000 | -0.1 | -0.006 | -1.4 | -0.005 | -1.1 | -0.004 | -1.0 |
| Standardised attendance allowance/severe disability allowance | 0.000 | 0.3 | 0.009 | 2.6 | 0.006 | 2.4 | 0.004 | 1.9 |
| Attendance allowance claimants over 60 years | -0.972 | -0.9 | -1.727 | -1.4 | -2.481 | -2.0 | -2.241 | -1.8 |
| Income support claimants over 60 years | -0.041 | -0.1 | 0.199 | 0.3 | 0.066 | 0.1 | 0.134 | 0.2 |
| Proportion attendance allowance/severe disability allowance | -0.017 | -0.5 | -0.146 | -2.2 | -0.070 | -1.8 | -0.050 | -1.3 |
| Proportion incapacity benefit/severe disability allowance | 0.059 | 0.8 | 0.151 | 1.9 | 0.140 | 1.7 | 0.133 | 1.6 |
| Mean beds at acute providers used | 0.000 | -1.6 | 0.000 | -1.5 | 0.000 | -0.9 | 0.000 | -1.1 |
| Mean distance to acute providers used | 0.004 | 2.4 | 0.004 | 2.5 | 0.003 | 1.9 | 0.004 | 2.2 |
| Mean number of consultants at acute providers used | 0.000 | 0.1 | 0.000 | 0.3 | 0.000 | 0.0 | 0.000 | 0.1 |
| Mean number of staff at acute providers used | 0.000 | 0.1 | 0.000 | -0.2 | 0.000 | -0.2 | 0.000 | -0.2 |
| Mean proportion outpatients seen < 4 weeks | 0.240 | 0.7 | 0.285 | 0.9 | 0.354 | 1.1 | 0.284 | 0.9 |
| Mean proportion outpatients seen < 13 weeks | -0.321 | -0.7 | -0.523 | -1.0 | -1.027 | -1.9 | -0.806 | -1.5 |
| Mean proportion outpatients seen < 26 weeks | 0.099 | 0.2 | 0.498 | 0.6 | 1.452 | 1.8 | 1.058 | 1.4 |
| Mean proportion inpatients seen < 3 months | -0.063 | -0.2 | -0.024 | -0.1 | 0.180 | 0.4 | 0.070 | 0.2 |
| Mean proportion inpatients seen < 6 months | 0.010 | 0.0 | -0.150 | -0.2 | -0.279 | -0.4 | -0.151 | -0.2 |
| Mean proportion inpatients seen < 12 months | 0.994 | 1.3 | 1.328 | 1.7 | 0.873 | 1.1 | 0.958 | 1.2 |
| Mean waiting time for elective admissions | 0.000 | 0.0 | 0.000 | 0.3 | 0.001 | 0.4 | 0.000 | 0.4 |
| Median waiting time for elective admissions | -0.002 | -1.0 | -0.002 | -1.3 | -0.003 | -1.5 | -0.002 | -1.4 |
| Mean number waiting for elective admissions | 0.000 | 0.3 | 0.000 | 0.2 | 0.000 | 0.5 | 0.000 | 0.3 |
| Accessibility score for acute beds | 59.433 | 1.2 | 27.386 | 0.5 | -53.708 | -0.9 | -5.758 | -0.1 |
| Accessibility score for mental health beds | -84.834 | -1.4 | -76.477 | -1.3 | -43.043 | -0.7 | -53.984 | -0.9 |
| Accessibility score for maternity beds | -421.76 | -0.8 | -108.49 | -0.2 | 608.13 | 1.0 | 189.53 | 0.3 |
| Accessibility score for private beds | 5.850 | 0.0 | 70.387 | 0.4 | 16.085 | 0.1 | 93.020 | 0.6 |
| Mean waiting time at 5 nearest acute providers | 0.001 | 1.1 | 0.001 | 1.3 | 0.002 | 1.8 | 0.002 | 1.5 |
| Mean distance to 5 nearest acute providers | -0.007 | -1.9 | -0.011 | -2.6 | -0.014 | -3.4 | -0.012 | -3.0 |
| Mean beds at 5 nearest acute providers | 0.000 | 0.8 | 0.000 | 1.3 | 0.000 | 2.0 | 0.000 | 1.5 |
| Mean distance to 5 nearest mental health providers | 0.001 | 0.4 | 0.002 | 0.8 | 0.004 | 1.3 | 0.003 | 1.0 |
| Mean beds at 5 nearest mental health providers | 0.000 | -0.2 | 0.000 | -0.8 | 0.000 | -1.6 | 0.000 | -1.1 |
| Mean distance to 5 nearest maternity providers | 0.003 | 1.1 | 0.003 | 1.1 | 0.004 | 1.4 | 0.003 | 1.2 |
| Mean beds at 5 nearest maternity providers | 0.001 | 0.8 | 0.001 | 0.6 | 0.000 | 0.0 | 0.000 | 0.4 |
| Mean distance to 5 nearest private providers | -0.001 | -0.3 | 0.000 | -0.2 | -0.001 | -0.6 | -0.001 | -0.2 |
| Mean beds at 5 nearest private providers | 0.000 | -0.8 | -0.001 | -1.1 | -0.001 | -0.9 | -0.001 | -0.9 |
| East Government Office Region | 0.067 | 1.3 | 0.066 | 1.4 | -0.005 | -0.1 | 0.035 | 0.7 |
| East Midlands Government Office Region | 0.069 | 1.2 | 0.080 | 1.5 | 0.069 | 1.3 | 0.069 | 1.2 |
| North East Government Office Region | -0.023 | -0.3 | -0.041 | -0.5 | -0.107 | -1.3 | -0.073 | -0.9 |
| North West Government Office Region | 0.089 | 1.5 | 0.063 | 1.0 | -0.001 | 0.0 | 0.037 | 0.6 |
| South East Government Office Region | 0.021 | 0.4 | 0.009 | 0.2 | -0.043 | -0.8 | -0.006 | -0.1 |
| South West Government Office Region | 0.078 | 1.2 | 0.043 | 0.7 | -0.036 | -0.5 | 0.016 | 0.2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| West Midlands Government Office Region | 0.062 | 1.1 | 0.062 | 1.2 | 0.018 | 0.3 | 0.039 | 0.7 |
| Yorkshire and Humberside Government Office Region | 0.105 | 1.5 | 0.081 | 1.2 | 0.022 | 0.3 | 0.062 | 0.9 |
| Mean age-related capitation payment | | | 0.100 | 1.9 | | | | |
| Mean semi-detached house price/100,000 | | | | | 0.034 | 1.9 | | |

Notes

The number of observations in every model is 49,541.

1 Non-IV. The following individual level covariates are also included in every model but not reported: age; sex; income; social class of head of household; highest educational qualification; ethnic group; marital status; housing tenure; number of cars owned by household; month of interview; proxy respondent; year of survey; missing item dummy variables. Fifty four area level covariates are also included, comprising deprivation measures, crime rates, hospital supply measures, and GOR dummy variables.

2 IV-1: The instrument for GP supply is the mean semi-detached house price/100,000.  The covariates are as in footnote 1.

3 IV-2: The instrument for GP supply is the mean age-related capitation payment. The covariates are as in footnote 1.

4 IV-3: The instruments for GP supply are the mean age-related capitation payment and the mean semi-detached house price/100,000. The covariates are as in footnote 1.

5 In the IV models the standard error on GP supply is the standard deviation of the coefficient from 200 replications. All other SEs are corrected for clustering in local authorities.

a The baseline category is I.

b The baseline category is Degree.

c The baseline category is White.

d The baseline category is Single.

e The baseline category is Own outright.

f The baseline category is 0.

g The baseline category is January.

h The baseline category is 1998.

**Table A4. Impact of GP supply on cardinalised self-reported general health. Regression model = interval regression.**

| | Non-IV [1] | | IV-1 [2] | | IV-2 [3] | | IV-3 [4] | |
|---|---|---|---|---|---|---|---|---|
| | β | β/SE | β | β/SE | β | β/SE | β | β/SE |
| ln(WTE GPs per 1,000 patients) [5] | 0.031 | 1.3 | 0.146 | 1.8 | 0.272 | 3.6 | 0.205 | 2.8 |
| Age/100 | 0.471 | 6.6 | 0.468 | 6.6 | 0.467 | 6.5 | 0.468 | 6.6 |
| Age/100 squared | -2.017 | -10.6 | -2.010 | -10.6 | -2.007 | -10.6 | -2.010 | -10.6 |
| Age/100 cubed | 1.465 | 9.6 | 1.459 | 9.6 | 1.458 | 9.6 | 1.459 | 9.6 |
| Female | 0.021 | 3.5 | 0.021 | 3.5 | 0.021 | 3.5 | 0.021 | 3.5 |
| Female*Age/100 | -0.301 | -4.3 | -0.299 | -4.3 | -0.299 | -4.3 | -0.300 | -4.3 |
| Female*Age/100 squared | 0.773 | 3.9 | 0.766 | 3.9 | 0.767 | 3.9 | 0.768 | 3.9 |
| Female*Age/100 cubed | -0.482 | -3.1 | -0.477 | -3.1 | -0.478 | -3.1 | -0.479 | -3.1 |
| Income/100,000 | 0.059 | 9.2 | 0.060 | 9.2 | 0.059 | 9.1 | 0.060 | 9.2 |
| Missing | 0.000 | -0.2 | -0.001 | -0.2 | -0.001 | -0.2 | -0.001 | -0.2 |
| **Social class of head of household [a]** | | | | | | | | |
| II Managerial/technical | -0.001 | -0.2 | -0.001 | -0.3 | -0.001 | -0.3 | -0.001 | -0.3 |
| IIIN Skilled non-manual | -0.001 | -0.1 | -0.001 | -0.2 | -0.001 | -0.2 | -0.001 | -0.2 |
| IIIM Skilled manual | -0.019 | -4.0 | -0.019 | -4.0 | -0.019 | -4.0 | -0.019 | -4.0 |
| IV Semi-skilled manual | -0.022 | -4.4 | -0.022 | -4.5 | -0.022 | -4.5 | -0.022 | -4.5 |
| V Unskilled manual | -0.038 | -4.9 | -0.038 | -4.9 | -0.038 | -4.9 | -0.038 | -4.9 |
| Other | -0.022 | -3.2 | -0.022 | -3.2 | -0.022 | -3.2 | -0.022 | -3.2 |
| Missing | 0.000 | 0.0 | 0.000 | 0.0 | 0.001 | 0.0 | 0.001 | 0.0 |
| **Highest educational qualification [b]** | | | | | | | | |
| Higher education less than a degree | -0.012 | -3.3 | -0.012 | -3.3 | -0.012 | -3.3 | -0.012 | -3.3 |
| A level or equivalent | -0.014 | -3.8 | -0.014 | -3.7 | -0.014 | -3.7 | -0.014 | -3.7 |
| GCSE or equivalent | -0.022 | -6.5 | -0.022 | -6.5 | -0.022 | -6.5 | -0.022 | -6.4 |
| CSE or equivalent | -0.048 | -8.1 | -0.047 | -8.1 | -0.047 | -8.0 | -0.047 | -8.1 |
| Other qualification | -0.031 | -4.8 | -0.031 | -4.8 | -0.031 | -4.8 | -0.031 | -4.8 |
| No qualification | -0.083 | -17.2 | -0.082 | -17.2 | -0.082 | -17.2 | -0.082 | -17.2 |
| Missing | -0.017 | -0.9 | -0.017 | -0.9 | -0.017 | -0.8 | -0.016 | -0.8 |
| **Ethnic group [c]** | | | | | | | | |
| Black Caribbean | -0.022 | -2.8 | -0.022 | -2.7 | -0.021 | -2.7 | -0.022 | -2.7 |
| Black African | 0.006 | 0.5 | 0.005 | 0.4 | 0.004 | 0.4 | 0.004 | 0.4 |
| Black Other | -0.033 | -3.2 | -0.033 | -3.2 | -0.032 | -3.1 | -0.033 | -3.2 |
| Indian | -0.054 | -8.8 | -0.054 | -8.9 | -0.054 | -8.8 | -0.054 | -8.9 |
| Pakistani | -0.055 | -7.6 | -0.056 | -7.7 | -0.056 | -7.7 | -0.056 | -7.6 |
| Bangladeshi | -0.063 | -7.0 | -0.062 | -7.1 | -0.062 | -7.1 | -0.062 | -7.1 |
| Chinese | -0.035 | -2.8 | -0.035 | -2.8 | -0.034 | -2.8 | -0.035 | -2.8 |
| Other non-white ethnic group | -0.025 | -3.5 | -0.025 | -3.5 | -0.025 | -3.5 | -0.025 | -3.5 |
| Missing | -0.057 | -2.0 | -0.057 | -2.0 | -0.058 | -2.1 | -0.057 | -2.1 |
| **Marital status [d]** | | | | | | | | |
| Married | 0.013 | 3.7 | 0.013 | 3.7 | 0.013 | 3.6 | 0.013 | 3.7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Separated | -0.007 | -0.8 | -0.007 | -0.8 | -0.007 | -0.8 | -0.007 | -0.8 |
| Divorced | -0.011 | -1.8 | -0.011 | -1.8 | -0.011 | -1.8 | -0.011 | -1.8 |
| Widowed | 0.012 | 1.6 | 0.012 | 1.6 | 0.012 | 1.6 | 0.012 | 1.6 |
| Missing | 0.009 | 0.5 | 0.009 | 0.4 | 0.008 | 0.4 | 0.008 | 0.4 |
| **Housing tenure [e]** | | | | | | | | |
| Mortgage | -0.017 | -4.3 | -0.017 | -4.3 | -0.017 | -4.3 | -0.017 | -4.3 |
| Part mortgage part rent | -0.068 | -4.1 | -0.068 | -4.1 | -0.068 | -4.1 | -0.068 | -4.1 |
| Rent | -0.051 | -9.9 | -0.050 | -9.8 | -0.050 | -9.8 | -0.050 | -9.8 |
| Living rent free | -0.013 | -1.2 | -0.013 | -1.2 | -0.013 | -1.2 | -0.013 | -1.2 |
| Missing | -0.020 | -1.0 | -0.020 | -1.0 | -0.020 | -1.0 | -0.020 | -1.0 |
| **Cars owned by household [f]** | | | | | | | | |
| 1 | 0.027 | 6.7 | 0.027 | 6.7 | 0.027 | 6.7 | 0.027 | 6.7 |
| 2 | 0.035 | 8.6 | 0.035 | 8.6 | 0.035 | 8.6 | 0.035 | 8.6 |
| 3 or more | 0.033 | 6.1 | 0.033 | 6.1 | 0.033 | 6.1 | 0.033 | 6.1 |
| Missing | -0.002 | -0.1 | -0.002 | -0.1 | -0.002 | -0.1 | -0.002 | -0.1 |
| **Month of interview [g]** | | | | | | | | |
| February | -0.006 | -1.2 | -0.006 | -1.2 | -0.006 | -1.2 | -0.006 | -1.2 |
| March | -0.001 | -0.2 | -0.001 | -0.2 | -0.001 | -0.1 | -0.001 | -0.2 |
| April | -0.003 | -0.5 | -0.003 | -0.5 | -0.003 | -0.5 | -0.003 | -0.5 |
| May | -0.006 | -1.0 | -0.005 | -0.9 | -0.006 | -1.0 | -0.005 | -0.9 |
| June | 0.005 | 0.9 | 0.006 | 1.1 | 0.006 | 1.1 | 0.006 | 1.1 |
| July | -0.001 | -0.2 | -0.001 | -0.2 | -0.001 | -0.2 | -0.001 | -0.2 |
| August | 0.003 | 0.5 | 0.003 | 0.5 | 0.003 | 0.5 | 0.003 | 0.5 |
| September | 0.005 | 0.9 | 0.005 | 0.9 | 0.005 | 0.9 | 0.005 | 0.9 |
| October | 0.003 | 0.5 | 0.003 | 0.5 | 0.003 | 0.5 | 0.003 | 0.5 |
| November | -0.001 | -0.1 | -0.001 | -0.1 | -0.001 | -0.1 | -0.001 | -0.1 |
| December | 0.004 | 0.7 | 0.005 | 0.7 | 0.005 | 0.7 | 0.005 | 0.7 |
| Proxy respondent | 0.014 | 2.9 | 0.014 | 2.9 | 0.014 | 2.9 | 0.014 | 2.9 |
| **Year [h]** | | | | | | | | |
| 1999 | 0.003 | 1.1 | -0.001 | -0.2 | 0.003 | 1.0 | 0.003 | 1.1 |
| 2000 | -0.001 | -0.2 | -0.027 | -1.7 | -0.002 | -0.7 | -0.002 | -0.6 |
| ***Local authority level variables*** | | | | | | | | |
| Violent offences, rate per 1,000 population, 2000 | 0.000 | 0.2 | 0.000 | 0.5 | 0.000 | 0.6 | 0.000 | 0.8 |
| Sexual offences, rate per 1,000 population, 2000 | 0.005 | 0.6 | 0.005 | 0.6 | -0.002 | -0.2 | 0.001 | 0.1 |
| Robbery, rate per 1,000 population, 2000 | 0.000 | 0.4 | 0.000 | 0.1 | 0.000 | 0.2 | 0.000 | 0.3 |
| Burglary from a dwelling, rate per 1,000 households, 2000 | 0.000 | -0.5 | 0.000 | 0.1 | 0.000 | 0.2 | 0.000 | 0.0 |
| Theft of a motor vehicle, rate per 1,000 population, 2000 | 0.000 | -0.3 | 0.000 | -0.3 | 0.000 | 0.0 | 0.000 | -0.3 |
| Theft from a motor vehicle, rate per 1,000 population, 2000 | 0.000 | -0.1 | 0.000 | -0.3 | 0.000 | -0.5 | 0.000 | -0.2 |
| Index of deprivation score | -0.005 | -2.4 | -0.007 | -3.1 | -0.009 | -3.7 | -0.008 | -3.3 |
| Income domain score | 0.002 | 1.1 | 0.003 | 1.4 | 0.005 | 2.1 | 0.004 | 1.7 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Employment domain score | -0.003 | -0.5 | 0.000 | -0.1 | -0.001 | -0.2 | -0.001 -0.3 |
| Education domain score | 0.016 | 1.8 | 0.022 | 2.4 | 0.026 | 2.8 | 0.024 2.6 |
| Housing domain score | 0.003 | 0.5 | 0.006 | 1.1 | 0.005 | 0.9 | 0.005 0.9 |
| Child poverty domain score | 0.000 | 0.2 | 0.000 | 0.2 | 0.000 | 0.1 | 0.000 0.3 |
| Job seekers' allowance, benefits in payment | 0.007 | 1.5 | 0.007 | 1.4 | 0.007 | 1.6 | 0.008 1.6 |
| Percentage aged 17 or over not going to Higher Education | 0.000 | 0.3 | 0.000 | 0.7 | 0.001 | 1.2 | 0.000 0.7 |
| Standardised incapacity benefit/severe disability allowance | 0.000 | 0.7 | -0.001 | -0.7 | 0.000 | -0.5 | 0.000 -0.4 |
| Standardised attendance allowance/severe disability allowance | 0.000 | -0.6 | 0.001 | 1.9 | 0.001 | 1.8 | 0.001 1.3 |
| Attendance allowance claimants over 60 years | -0.178 | -1.0 | -0.340 | -1.6 | -0.448 | -2.2 | -0.413 -2.0 |
| Income support claimants over 60 years | 0.017 | 0.2 | 0.061 | 0.6 | 0.040 | 0.4 | 0.051 0.5 |
| Proportion attendance allowance/severe disability allowance | -0.001 | -0.1 | -0.020 | -1.8 | -0.010 | -1.5 | -0.007 -1.1 |
| Proportion incapacity benefit/severe disability allowance | 0.003 | 0.2 | 0.019 | 1.4 | 0.018 | 1.3 | 0.017 1.2 |
| Mean beds at acute providers used | 0.000 | -2.3 | 0.000 | -2.2 | 0.000 | -1.6 | 0.000 -1.9 |
| Mean distance to acute providers used | 0.001 | 2.5 | 0.001 | 2.5 | 0.001 | 1.9 | 0.001 2.3 |
| Mean number of consultants at acute providers used | 0.000 | -0.1 | 0.000 | 0.0 | 0.000 | -0.2 | 0.000 -0.1 |
| Mean number of staff at acute providers used | 0.000 | 0.6 | 0.000 | 0.3 | 0.000 | 0.2 | 0.000 0.3 |
| Mean proportion outpatients seen < 4 weeks | 0.051 | 1.1 | 0.059 | 1.2 | 0.070 | 1.4 | 0.059 1.2 |
| Mean proportion outpatients seen < 13 weeks | -0.103 | -1.3 | -0.151 | -1.8 | -0.225 | -2.6 | -0.191 -2.3 |
| Mean proportion outpatients seen < 26 weeks | 0.109 | 0.9 | 0.206 | 1.5 | 0.345 | 2.4 | 0.285 2.1 |
| Mean proportion inpatients seen < 3 months | -0.037 | -0.5 | -0.027 | -0.4 | 0.003 | 0.1 | -0.013 -0.2 |
| Mean proportion inpatients seen < 6 months | 0.034 | 0.3 | 0.008 | 0.1 | -0.012 | -0.1 | 0.007 0.1 |
| Mean proportion inpatients seen < 12 months | 0.067 | 0.5 | 0.109 | 0.8 | 0.044 | 0.3 | 0.057 0.4 |
| Mean waiting time for elective admissions | 0.000 | -0.9 | 0.000 | -0.6 | 0.000 | -0.4 | 0.000 -0.5 |
| Median waiting time for elective admissions | 0.000 | -0.4 | 0.000 | -0.7 | 0.000 | -0.9 | 0.000 -0.8 |
| Mean number waiting for elective admissions | 0.000 | -0.3 | 0.000 | -0.3 | 0.000 | 0.0 | 0.000 -0.2 |
| Accessibility score for acute beds | 10.145 | 1.2 | 2.572 | 0.3 | -9.461 | -0.9 | -2.100 -0.2 |
| Accessibility score for mental health beds | -18.295 | -1.7 | -15.763 | -1.5 | -10.900 | -1.1 | -12.580 -1.2 |
| Accessibility score for maternity beds | -45.279 | -0.5 | 28.970 | 0.3 | 135.224 | 1.3 | 70.992 0.8 |
| Accessibility score for private beds | -5.454 | -0.2 | 6.820 | 0.3 | -1.907 | -0.1 | 10.025 0.4 |
| Mean waiting time at 5 nearest acute providers | 0.000 | 1.2 | 0.000 | 1.4 | 0.000 | 1.9 | 0.000 1.7 |
| Mean distance to 5 nearest acute providers | -0.001 | -2.2 | -0.002 | -3.0 | -0.003 | -3.7 | -0.002 -3.4 |
| Mean beds at 5 nearest acute providers | 0.000 | 0.7 | 0.000 | 1.4 | 0.000 | 1.9 | 0.000 1.6 |
| Mean distance to 5 nearest mental health providers | 0.000 | 0.4 | 0.000 | 0.9 | 0.001 | 1.4 | 0.000 1.1 |
| Mean beds at 5 nearest mental health providers | 0.000 | 0.0 | 0.000 | -0.8 | 0.000 | -1.6 | 0.000 -1.1 |
| Mean distance to 5 nearest maternity providers | 0.001 | 1.7 | 0.001 | 1.8 | 0.001 | 2.0 | 0.001 1.9 |
| Mean beds at 5 nearest maternity providers | 0.000 | 1.1 | 0.000 | 0.8 | 0.000 | 0.2 | 0.000 0.6 |
| Mean distance to 5 nearest private providers | 0.000 | -0.5 | 0.000 | -0.3 | 0.000 | -0.7 | 0.000 -0.4 |
| Mean beds at 5 nearest private providers | 0.000 | 0.0 | 0.000 | -0.3 | 0.000 | 0.0 | 0.000 -0.1 |
| East Government Office Region | 0.006 | 0.7 | 0.004 | 0.5 | -0.006 | -0.7 | 0.000 0.0 |
| East Midlands Government Office Region | 0.004 | 0.4 | 0.005 | 0.6 | 0.004 | 0.4 | 0.004 0.4 |
| North East Government Office Region | -0.015 | -1.1 | -0.019 | -1.5 | -0.029 | -2.1 | -0.024 -1.8 |
| North West Government Office Region | 0.011 | 1.1 | 0.005 | 0.5 | -0.004 | -0.4 | 0.001 0.1 |
| South East Government Office Region | -0.001 | -0.1 | -0.004 | -0.5 | -0.011 | -1.3 | -0.006 -0.7 |
| South West Government Office Region | 0.007 | 0.7 | 0.000 | -0.1 | -0.012 | -1.0 | -0.004 -0.4 |
| West Midlands Government Office Region | 0.004 | 0.4 | 0.003 | 0.3 | -0.004 | -0.4 | -0.001 -0.1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Yorkshire and Humberside Government Office Region | 0.017 | 1.6 | 0.012 | 1.2 | 0.004 | 0.3 | 0.010 | 0.9 |
| Mean age-related capitation payment | | | 0.014 | 1.6 | | | | |
| Mean semi-detached house price/100,000 | | | | | 0.005 | 1.8 | | |
| | | | | | | | | |
| Constant | 0.828 | 6.6 | 0.560 | 2.6 | 0.860 | 6.9 | 0.854 | 6.8 |

Notes

The number of observations in every model is 49,541.

1 Non-IV. The following individual level covariates are also included in every model but not reported: age; sex; income; social class of head of household; highest educational qualification; ethnic group; marital status; housing tenure; number of cars owned by household; month of interview; proxy respondent; year of survey; missing item dummy variables. Fifty four area level covariates are also included, comprising deprivation measures, crime rates, hospital supply measures, and GOR dummy variables.

2 IV-1: The instrument for GP supply is the mean semi-detached house price/100,000.  The covariates are as in footnote 1.

3 IV-2: The instrument for GP supply is the mean age-related capitation payment. The covariates are as in footnote 1.

4 IV-3: The instruments for GP supply are the mean age-related capitation payment and the mean semi-detached house price/100,000. The covariates are as in footnote 1.

5 In the IV models the standard error on GP supply is the standard deviation of the coefficient from 200 replications. All other SEs are corrected for clustering in local authorities.

 a The baseline category is I.

b The baseline category is Degree.

c The baseline category is White.

d The baseline category is Single.

e The baseline category is Own outright.

f The baseline category is 0.

g The baseline category is January.

h The baseline category is 1998.

**Table A5. Impact of GP supply on mean EQ5D score by self reported general health category. Regression model = OLS.**

| | Non-IV [1] | | IV-1 [2] | | IV-2 [3] | | IV-3 [4] | |
|---|---|---|---|---|---|---|---|---|
| | β | β/SE | β | β/SE | β | β/SE | β | β/SE |
| ln(WTE GPs per 1,000 patients) [5] | 0.014 | 0.9 | 0.080 | 1.6 | 0.148 | 3.2 | 0.109 | 2.5 |
| | | | | | | | | |
| Age/100 | 0.270 | 6.0 | 0.269 | 6.0 | 0.268 | 6.0 | 0.268 | 6.0 |
| Age/100 squared | -1.207 | -10.2 | -1.203 | -10.2 | -1.202 | -10.2 | -1.203 | -10.2 |
| Age/100 cubed | 0.890 | 9.4 | 0.887 | 9.4 | 0.886 | 9.4 | 0.887 | 9.4 |
| Female | 0.013 | 3.7 | 0.013 | 3.7 | 0.013 | 3.6 | 0.013 | 3.7 |
| Female*Age/100 | -0.183 | -4.3 | -0.182 | -4.3 | -0.182 | -4.3 | -0.182 | -4.3 |
| Female*Age/100 squared | 0.475 | 3.9 | 0.471 | 3.9 | 0.471 | 3.9 | 0.472 | 3.9 |
| Female*Age/100 cubed | -0.297 | -3.1 | -0.294 | -3.1 | -0.294 | -3.1 | -0.295 | -3.1 |
| | | | | | | | | |
| Income/100,000 | 0.035 | 8.9 | 0.035 | 8.9 | 0.035 | 8.9 | 0.035 | 8.9 |
| Missing | -0.001 | -0.3 | -0.001 | -0.3 | -0.001 | -0.3 | -0.001 | -0.3 |
| | | | | | | | | |
| **Social class of head of household [a]** | | | | | | | | |
| II Managerial/technical | 0.000 | -0.1 | 0.000 | -0.1 | 0.000 | -0.1 | 0.000 | -0.1 |
| IIIN Skilled non-manual | 0.000 | -0.1 | 0.000 | -0.1 | 0.000 | -0.1 | 0.000 | -0.1 |
| IIIM Skilled manual | -0.011 | -3.9 | -0.011 | -3.9 | -0.011 | -3.9 | -0.011 | -3.9 |
| IV Semi-skilled manual | -0.013 | -4.2 | -0.013 | -4.2 | -0.013 | -4.2 | -0.013 | -4.2 |
| V Unskilled manual | -0.023 | -4.8 | -0.023 | -4.8 | -0.023 | -4.8 | -0.023 | -4.8 |
| Other | -0.013 | -3.1 | -0.013 | -3.1 | -0.013 | -3.1 | -0.013 | -3.1 |
| Missing | 0.000 | 0.0 | 0.000 | 0.0 | 0.001 | 0.1 | 0.001 | 0.1 |
| | | | | | | | | |
| **Highest educational qualification [b]** | | | | | | | | |
| Higher education less than a degree | -0.006 | -2.8 | -0.006 | -2.8 | -0.006 | -2.7 | -0.006 | -2.8 |
| A level or equivalent | -0.008 | -3.8 | -0.008 | -3.7 | -0.008 | -3.7 | -0.008 | -3.7 |
| GCSE or equivalent | -0.013 | -6.2 | -0.012 | -6.2 | -0.012 | -6.2 | -0.012 | -6.2 |
| CSE or equivalent | -0.028 | -7.8 | -0.028 | -7.8 | -0.028 | -7.8 | -0.028 | -7.8 |
| Other qualification | -0.019 | -4.8 | -0.019 | -4.8 | -0.019 | -4.8 | -0.019 | -4.8 |
| No qualification | -0.048 | -16.7 | -0.048 | -16.7 | -0.048 | -16.7 | -0.048 | -16.7 |
| Missing | -0.013 | -1.0 | -0.013 | -1.0 | -0.013 | -1.0 | -0.013 | -1.0 |
| | | | | | | | | |
| **Ethnic group [c]** | | | | | | | | |
| Black Caribbean | -0.013 | -2.7 | -0.013 | -2.7 | -0.013 | -2.6 | -0.013 | -2.7 |
| Black African | 0.004 | 0.5 | 0.003 | 0.5 | 0.003 | 0.5 | 0.003 | 0.5 |
| Black Other | -0.019 | -3.0 | -0.019 | -3.0 | -0.019 | -2.9 | -0.019 | -3.0 |
| Indian | -0.031 | -8.4 | -0.031 | -8.5 | -0.031 | -8.4 | -0.031 | -8.5 |
| Pakistani | -0.035 | -7.5 | -0.035 | -7.6 | -0.035 | -7.6 | -0.035 | -7.5 |
| Bangladeshi | -0.037 | -6.8 | -0.037 | -6.9 | -0.037 | -6.9 | -0.036 | -7.0 |
| Chinese | -0.019 | -2.5 | -0.019 | -2.5 | -0.018 | -2.5 | -0.018 | -2.5 |
| Other non-white ethnic group | -0.017 | -3.8 | -0.017 | -3.8 | -0.017 | -3.8 | -0.017 | -3.8 |
| Missing | -0.028 | -1.6 | -0.028 | -1.6 | -0.029 | -1.6 | -0.028 | -1.6 |
| | | | | | | | | |
| **Marital status [d]** | | | | | | | | |
| Married | 0.008 | 3.8 | 0.008 | 3.8 | 0.008 | 3.8 | 0.008 | 3.8 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Separated | -0.005 | -1.0 | -0.005 | -1.0 | -0.005 | -1.0 | -0.005 | -1.0 |
| Divorced | -0.008 | -2.1 | -0.008 | -2.1 | -0.008 | -2.1 | -0.008 | -2.1 |
| Widowed | 0.008 | 1.7 | 0.008 | 1.7 | 0.008 | 1.7 | 0.008 | 1.7 |
| Missing | 0.007 | 0.5 | 0.006 | 0.5 | 0.006 | 0.5 | 0.006 | 0.5 |
| **Housing tenure [e]** | | | | | | | | |
| Mortgage | -0.011 | -4.4 | -0.010 | -4.4 | -0.010 | -4.4 | -0.011 | -4.4 |
| Part mortgage part rent | -0.043 | -4.3 | -0.043 | -4.3 | -0.043 | -4.3 | -0.043 | -4.3 |
| Rent | -0.031 | -9.5 | -0.030 | -9.5 | -0.030 | -9.5 | -0.030 | -9.5 |
| Living rent free | -0.010 | -1.5 | -0.010 | -1.4 | -0.010 | -1.5 | -0.010 | -1.4 |
| Missing | -0.008 | -0.7 | -0.008 | -0.7 | -0.008 | -0.7 | -0.008 | -0.7 |
| **Cars owned by household [f]** | | | | | | | | |
| 1 | 0.016 | 6.8 | 0.016 | 6.8 | 0.016 | 6.8 | 0.016 | 6.8 |
| 2 | 0.021 | 8.7 | 0.021 | 8.6 | 0.021 | 8.7 | 0.021 | 8.6 |
| 3 or more | 0.021 | 6.5 | 0.021 | 6.5 | 0.021 | 6.5 | 0.021 | 6.5 |
| Missing | -0.005 | -0.3 | -0.005 | -0.3 | -0.004 | -0.3 | -0.005 | -0.3 |
| **Month of interview [g]** | | | | | | | | |
| February | -0.004 | -1.2 | -0.004 | -1.2 | -0.004 | -1.2 | -0.004 | -1.2 |
| March | 0.000 | 0.1 | 0.001 | 0.2 | 0.001 | 0.2 | 0.000 | 0.2 |
| April | -0.001 | -0.2 | -0.001 | -0.2 | -0.001 | -0.2 | -0.001 | -0.2 |
| May | -0.004 | -1.0 | -0.004 | -1.0 | -0.004 | -1.1 | -0.004 | -1.0 |
| June | 0.004 | 1.2 | 0.004 | 1.3 | 0.004 | 1.3 | 0.004 | 1.3 |
| July | -0.001 | -0.3 | -0.001 | -0.3 | -0.001 | -0.3 | -0.001 | -0.3 |
| August | 0.002 | 0.6 | 0.002 | 0.6 | 0.002 | 0.6 | 0.002 | 0.6 |
| September | 0.003 | 1.1 | 0.004 | 1.1 | 0.004 | 1.1 | 0.004 | 1.1 |
| October | 0.002 | 0.5 | 0.002 | 0.5 | 0.002 | 0.5 | 0.002 | 0.5 |
| November | 0.000 | 0.0 | 0.000 | 0.1 | 0.000 | 0.0 | 0.000 | 0.0 |
| December | 0.002 | 0.6 | 0.003 | 0.7 | 0.003 | 0.6 | 0.003 | 0.6 |
| Proxy respondent | 0.007 | 2.4 | 0.007 | 2.4 | 0.007 | 2.4 | 0.007 | 2.4 |
| **Year [h]** | | | | | | | | |
| 1999 | 0.002 | 1.2 | 0.000 | 0.1 | 0.002 | 1.2 | 0.002 | 1.2 |
| 2000 | 0.000 | -0.1 | -0.013 | -1.4 | -0.001 | -0.6 | -0.001 | -0.4 |
| *Local authority level variables* | | | | | | | | |
| Violent offences, rate per 1,000 population, 2000 | 0.000 | 0.1 | 0.000 | 0.4 | 0.000 | 0.4 | 0.000 | 0.6 |
| Sexual offences, rate per 1,000 population, 2000 | 0.002 | 0.5 | 0.002 | 0.5 | -0.001 | -0.3 | 0.000 | 0.0 |
| Robbery, rate per 1,000 population, 2000 | 0.000 | 0.7 | 0.000 | 0.4 | 0.000 | 0.5 | 0.000 | 0.6 |
| Burglary from a dwelling, rate per 1,000 households, 2000 | 0.000 | -0.5 | 0.000 | 0.0 | 0.000 | 0.2 | 0.000 | 0.0 |
| Theft of a motor vehicle, rate per 1,000 population, 2000 | 0.000 | -0.3 | 0.000 | -0.3 | 0.000 | 0.0 | 0.000 | -0.3 |
| Theft from a motor vehicle, rate per 1,000 population, 2000 | 0.000 | -0.3 | 0.000 | -0.5 | 0.000 | -0.7 | 0.000 | -0.4 |
| Index of deprivation score | -0.003 | -2.3 | -0.004 | -3.0 | -0.005 | -3.5 | -0.004 | -3.2 |
| Income domain score | 0.001 | 0.9 | 0.002 | 1.2 | 0.002 | 1.8 | 0.002 | 1.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Employment domain score | -0.001 | -0.3 | 0.000 | 0.1 | 0.000 | 0.0 | 0.000 | -0.1 |
| Education domain score | 0.010 | 1.9 | 0.014 | 2.4 | 0.016 | 2.9 | 0.015 | 2.6 |
| Housing domain score | 0.000 | 0.0 | 0.002 | 0.6 | 0.002 | 0.5 | 0.001 | 0.4 |
| Child poverty domain score | 0.000 | 0.7 | 0.000 | 0.7 | 0.000 | 0.6 | 0.000 | 0.7 |
| Job seekers' allowance, benefits in payment | 0.003 | 1.1 | 0.003 | 1.1 | 0.003 | 1.2 | 0.004 | 1.3 |
| Percentage aged 17 or over not going to Higher Education | 0.000 | 0.4 | 0.000 | 0.7 | 0.001 | 1.2 | 0.000 | 0.7 |
| Standardised incapacity benefit/severe disability allowance | 0.000 | 1.1 | 0.000 | -0.2 | 0.000 | 0.0 | 0.000 | 0.1 |
| Standardised attendance allowance/severe disability allowance | 0.000 | -1.1 | 0.001 | 1.4 | 0.000 | 1.3 | 0.000 | 0.8 |
| Attendance allowance claimants over 60 years | -0.092 | -0.8 | -0.186 | -1.5 | -0.243 | -1.9 | -0.222 | -1.8 |
| Income support claimants over 60 years | 0.007 | 0.1 | 0.031 | 0.5 | 0.020 | 0.3 | 0.026 | 0.4 |
| Proportion attendance allowance/severe disability allowance | 0.000 | 0.0 | -0.010 | -1.5 | -0.005 | -1.3 | -0.003 | -0.9 |
| Proportion incapacity benefit/severe disability allowance | -0.001 | -0.2 | 0.007 | 0.9 | 0.007 | 0.8 | 0.006 | 0.7 |
| Mean beds at acute providers used | 0.000 | -2.6 | 0.000 | -2.4 | 0.000 | -1.9 | 0.000 | -2.2 |
| Mean distance to acute providers used | 0.000 | 2.3 | 0.000 | 2.3 | 0.000 | 1.8 | 0.000 | 2.1 |
| Mean number of consultants at acute providers used | 0.000 | -0.2 | 0.000 | -0.2 | 0.000 | -0.4 | 0.000 | -0.3 |
| Mean number of staff at acute providers used | 0.000 | 0.8 | 0.000 | 0.6 | 0.000 | 0.5 | 0.000 | 0.6 |
| Mean proportion outpatients seen < 4 weeks | 0.033 | 1.2 | 0.037 | 1.3 | 0.043 | 1.5 | 0.037 | 1.3 |
| Mean proportion outpatients seen < 13 weeks | -0.064 | -1.4 | -0.092 | -1.9 | -0.132 | -2.6 | -0.112 | -2.3 |
| Mean proportion outpatients seen < 26 weeks | 0.069 | 1.0 | 0.125 | 1.5 | 0.199 | 2.3 | 0.164 | 2.0 |
| Mean proportion inpatients seen < 3 months | -0.029 | -0.7 | -0.023 | -0.6 | -0.007 | -0.2 | -0.016 | -0.4 |
| Mean proportion inpatients seen < 6 months | 0.025 | 0.3 | 0.011 | 0.2 | 0.000 | 0.0 | 0.011 | 0.2 |
| Mean proportion inpatients seen < 12 months | 0.038 | 0.5 | 0.058 | 0.7 | 0.025 | 0.3 | 0.032 | 0.4 |
| Mean waiting time for elective admissions | 0.000 | -1.3 | 0.000 | -1.0 | 0.000 | -0.8 | 0.000 | -0.9 |
| Median waiting time for elective admissions | 0.000 | -0.2 | 0.000 | -0.5 | 0.000 | -0.7 | 0.000 | -0.6 |
| Mean number waiting for elective admissions | 0.000 | -0.6 | 0.000 | -0.6 | 0.000 | -0.4 | 0.000 | -0.6 |
| Accessibility score for acute beds | 7.987 | 1.6 | 3.527 | 0.6 | -3.054 | -0.5 | 1.208 | 0.2 |
| Accessibility score for mental health beds | -12.828 | -2.1 | -11.166 | -1.8 | -8.616 | -1.4 | -9.587 | -1.6 |
| Accessibility score for maternity beds | -42.801 | -0.8 | 0.895 | 0.0 | 58.948 | 1.0 | 21.751 | 0.4 |
| Accessibility score for private beds | -3.454 | -0.2 | 3.433 | 0.2 | -1.863 | -0.1 | 5.025 | 0.3 |
| Mean waiting time at 5 nearest acute providers | 0.000 | 1.2 | 0.000 | 1.4 | 0.000 | 1.9 | 0.000 | 1.6 |
| Mean distance to 5 nearest acute providers | -0.001 | -2.1 | -0.001 | -2.8 | -0.001 | -3.4 | -0.001 | -3.1 |
| Mean beds at 5 nearest acute providers | 0.000 | 0.5 | 0.000 | 1.2 | 0.000 | 1.7 | 0.000 | 1.3 |
| Mean distance to 5 nearest mental health providers | 0.000 | 0.4 | 0.000 | 0.9 | 0.000 | 1.3 | 0.000 | 1.0 |
| Mean beds at 5 nearest mental health providers | 0.000 | 0.0 | 0.000 | -0.8 | 0.000 | -1.4 | 0.000 | -1.0 |
| Mean distance to 5 nearest maternity providers | 0.000 | 1.6 | 0.000 | 1.7 | 0.001 | 1.9 | 0.001 | 1.8 |
| Mean beds at 5 nearest maternity providers | 0.000 | 1.4 | 0.000 | 1.1 | 0.000 | 0.6 | 0.000 | 0.9 |
| Mean distance to 5 nearest private providers | 0.000 | -0.5 | 0.000 | -0.4 | 0.000 | -0.8 | 0.000 | -0.5 |
| Mean beds at 5 nearest private providers | 0.000 | 0.3 | 0.000 | 0.1 | 0.000 | 0.3 | 0.000 | 0.2 |
| East Government Office Region | 0.003 | 0.5 | 0.002 | 0.3 | -0.004 | -0.7 | -0.001 | -0.1 |
| East Midlands Government Office Region | 0.000 | 0.1 | 0.001 | 0.2 | 0.001 | 0.1 | 0.001 | 0.1 |
| North East Government Office Region | -0.010 | -1.3 | -0.013 | -1.6 | -0.018 | -2.2 | -0.015 | -1.9 |
| North West Government Office Region | 0.006 | 0.9 | 0.002 | 0.4 | -0.003 | -0.4 | 0.001 | 0.1 |
| South East Government Office Region | -0.001 | -0.2 | -0.003 | -0.6 | -0.007 | -1.3 | -0.004 | -0.8 |
| South West Government Office Region | 0.003 | 0.5 | -0.001 | -0.2 | -0.008 | -1.1 | -0.003 | -0.5 |
| West Midlands Government Office Region | 0.001 | 0.3 | 0.001 | 0.1 | -0.003 | -0.5 | -0.001 | -0.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Yorkshire and Humberside Government Office Region | 0.011 | 1.6 | 0.008 | 1.3 | 0.003 | 0.4 | 0.006 | 1.0 |
| Mean age-related capitation payment | | | 0.007 | 1.3 | | | | |
| Mean semi-detached house price/100,000 | | | | | 0.003 | 1.7 | | |
| Constant | 0.844 | 11.3 | 0.712 | 5.5 | 0.862 | 11.6 | 0.859 | 11.5 |

Notes

The number of observations in every model is 49,541.

1 Non-IV. The following individual level covariates are also included in every model but not reported: age; sex; income; social class of head of household; highest educational qualification; ethnic group; marital status; housing tenure; number of cars owned by household; month of interview; proxy respondent; year of survey; missing item dummy variables. Fifty four area level covariates are also included, comprising deprivation measures, crime rates, hospital supply measures, and GOR dummy variables.

2 IV-1: The instrument for GP supply is the mean semi-detached house price/100,000.  The covariates are as in footnote 1.

3 IV-2: The instrument for GP supply is the mean age-related capitation payment. The covariates are as in footnote 1.

4 IV-3: The instruments for GP supply are the mean age-related capitation payment and the mean semi-detached house price/100,000. The covariates are as in footnote 1.

5 In the IV models the standard error on GP supply is the standard deviation of the coefficient from 200 replications. All other SEs are corrected for clustering in local authorities.

 a The baseline category is I.

b The baseline category is Degree.

c The baseline category is White.

d The baseline category is Single.

e The baseline category is Own outright.

f The baseline category is 0.

g The baseline category is January.

h The baseline category is 1998.