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ABSTRACT

Overseas GPs and Prescription Behaviour in England

The UK imports many doctors from abroad, where medical training and experience might be different. This study attempts to understand how drug prescription behaviour differs in English GP practices which have larger or smaller numbers of foreign-trained GPs. Results show that in general practices with a high share of GPs trained outside the UK, prescriptions for antibiotics, mental health medication, analgesics and antacids are higher, controlling for the characteristics of the patients and the practices. However, we find no evidence of any significant impact of such different prescribing behaviour neither on patients' satisfaction nor on unplanned hospitalisations, pointing to this behaviour being due to over-prescribing. Identifying differences in prescribing habits among GPs is paramount to identifying the policies best able to guarantee consistent services across GP practices and the consequent reduction of health inequalities.

JEL Classification: I1, C01, C55, C8

Keywords: GPs, immigration, prescriptions, NHS England

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1 Introduction

A global workforce crisis in healthcare is looming. The WHO estimates that by 2030 there will be a global shortage of approximately 18 million health workers, corresponding to 20% of the workforce needed to keep healthcare systems going (Britnell, 2019). The UK is no exception, being its health service is heavily dependent on foreign clinical staff. As the supply of physicians from British medical schools has been inadequate, over the past decades the UK has recruited physicians trained abroad both from European and non-European countries (Simpson, 2018; Taylor, 2020). This raises the issue of potential differences in the prescription behaviour of UK trained versus foreign-trained physicians operating in English general practices. Understanding how GPs trained overseas operate within the English general practices is important to shape future policies (i) to identify the gaps that a foreign-trade GP needs to fill to achieve UK standards, (ii) to guarantee a consistent prescribing behaviour across GPs, and (iii) to be able to attract more overseas GPs to the UK.

The continued funding squeeze in the health sector, a fast aging and obese population, and the need to safeguard quality care have put increasing pressure on the UK health system (Taylor, 2020). Hiring doctors of all grades have proved to be very challenging and many specialties in hospitals have been forced to run rotas with gaps filled by covering trainees. General practices in rural locations have struggled to fill vacancies (Weinhold and Gurtner, 2014). As a consequence of Brexit, in the past few years, the shortage of GPs has become even more severe (Esmail et al., 2017; Chakravorty et al., 2021; Owen et al., 2019), thus pushing the health system (NHS) in the UK to recruit even more overseas doctors. However, the terms of the UK exit from the European Union might have affected the ability of European Economic Area (EEA) qualified doctors to work in the UK (Majeed, 2017), while new visa requirements might have significantly impacted the inflows of non-EEA doctors (Esmail et al., 2017). In 2020, NHS England's International GP Recruitment Programme was established, aimed at recruiting 2000 GPs from overseas (NHS England, 2020). In 2022 nearly two-thirds of GPs operating in the UK have trained abroad (NHS digital), with India,

Pakistan, and Nigeria as the three largest providers. Many of these physicians are from countries with high utilisation of antibiotics (Adriaenssens et al., 2011; Radyowijati and Haak, 2003), and it is generally believed that physicians trained abroad have different prescribing patterns than physicians trained in the UK. This is probably due to the fact that the medical training programmes in other countries are different from the UK ones (Fletcher et al., 2020). Although it is necessary to pass tests and be registered internally to become a GP in the UK, foreign-trained doctors are likely to retain their previous attitudes and behaviours relating to prescriptions (Morrow et al., 2013). In this study, we provide evidence of the prescription behaviour of UK trained versus foreign-trained physicians operating in English general practices in 2019. We investigate the GP prescription approach for a number of different drug categories, such as antibiotics, antacids, analgesics and mental-health drugs.

Some studies provide evidence of different prescribing patterns amongst physicians trained abroad (Kozyrskyj et al., 2004; Cadieux et al., 2007; Sandvik et al., 2012). However, for the case of Sweden, Neumark et al. (2015) found minor and non-significant differences in antibiotic prescriptions when comparing GPs and residents trained abroad and in Sweden. To address this potential issue, the UK General Medical Council (GMC) is developing a methodology for comparing GP training and experiences in overseas countries, with the goal of identifying programmes which are closer to that provided in the UK.

Overall, comparative studies on drug prescribing patterns by diagnosis between prescribers trained abroad and those trained in the UK are lacking. Using data at the practice level and after controlling for practices and patients' characteristics, we find that the higher the share of GPs trained outside the UK within a GP practice, the higher the number of drug prescriptions. This finding holds across all the drug types considered. Our results also show that this different prescription behaviour does not have any impact on patients' satisfaction. In addition, we find no effect on unplanned hospitalisations, thus excluding the potential under-prescribing behaviour of UK-trained doctors.

The rest of the paper is organised as follows. Section 2 describes the data and illustrates the

methodology used for the estimation while Section 3 reports the findings. Section 4 concludes the paper with a discussion of potential mechanisms at play.

2 Methods

2.1 Data

Our study used data from multiple sources. The main data source is the National Health Applications and Infrastructure Services (NHAIS)/'Exeter' GP payment system, a computerised payment system for GPs in England, which provides doctor-level data for all permanently employed GPs on the following: age and gender, GP practice where the GP works, FTE status, GP type (partner, trainee, salaried or retainer) and country of qualification.

Fig. 1 reports the shares of GPs trained abroad by Clinical Commissioning Groups (CCGs). Data show that in 2019 in 14 out of 209 CCGs in England, more than half of the GPs were trained outside the UK; nationally more than one in five GPs was not UK-trained. In specific CCGs, such as Barking and Dagenham, London, two third of GPs were trained outside the UK.

We also have observations on the total number of patients in each practice, by gender and age. Unfortunately, the dataset does not provide information on patients' ethnicity. Therefore, we use data on the population ethnicity at Lower Layer Super Output Areas (LSOAs) level from the 2011 Census. LSOAs are standard areas created by the Office of National Statistics for the reporting of small-area statistics. They are fairly homogeneous in terms of population size to allow for comparisons over time and across areas. There are 32,844 LSOAs in England with an average population of 1500 people or 650 households. By mapping GP practices and patients resident in each LSOA, we are able to reconstruct the number of patients by ethnicity at the GP practice level. Similarly, we build the index of multiple deprivation (IMD) at the GP practice level. The IMD index is a measure of relative deprivation for small areas which is based on a total of 37 separate indicators that have been grouped into seven domains, each of which reflects a different

aspect of deprivation experienced by individuals living in an area. By mapping GP practices and patients resident in each LSOA, we reconstruct the index of multiple deprivation (IMD 2019) at GP practice level.

From the Quality and Outcomes Framework (QOF) we extract data on disease prevalence at GP practice level. Finally, using the GP practice code, we include data from the OpenPrescribing.net 2022 dataset, which offers information on monthly drug prescriptions at the GP practice level. From this dataset, we extract information on the number of items, i.e., the number of times a specific drug has been prescribed.

To test for possible mechanisms driving the main results, we consider two additional data sources. First, from the GP Patient Survey we extract data on patients' satisfaction. Specifically, we select measures of: (i) overall patient satisfaction, (ii) GPs understanding of patient mental health needs, and (iii) the involvement of patients in GPs decision-making. Our second data source is the NHS Outcomes Framework Indicators (NHS online), from which we select an indicator for unplanned hospitalisation at CCG level, which quantifies the number of people with specific long-term conditions who, if treated appropriately would not have required hospitalisation, but nevertheless have been admitted to the hospital as an emergency. This indicator, which we normalise by dividing it by the CCG population, informs about how successfully the NHS manages to reduce emergency admissions for long-term conditions, such as diabetes, epilepsy and high blood pressure. Our final dataset is a panel of the 6,013 GP practices in England observed each month in 2019 for a total of 72,156 observations.

2.2 Empirical Analysis

To assess the prescription behaviour of GPs with different training backgrounds, we exploit the different concentrations of overseas GPs across GP practices in England in 2019. We regress the average number of item drugs prescribed per patient within each GP practice, which is constructed by dividing the total number of items prescribed in each GP practice by the total number of patients, on the share of GPs who are trained overseas in each GP practice. We focus on four

different types of prescriptions: antibiotics, antacids, analgesics and mental health drugs as usually these are those most used by patients. The equation we estimate is:

$$Y_{pr} = \omega_0 + \omega_1 GPabroad_p + \omega_2 X_p + \psi_r + \epsilon_{pr}, \tag{1}$$

where the dependent variable, Y_{pr}, is the number of prescriptions per patient in GP practice p in the region r; $GPabroad_p$ is the share of GPs in practice p who are trained abroad; X_p includes characteristics of the practice p; ψ_r is the region fixed effect; ϵ_{pr} is the error term. As such, ω_1 is the coefficient of interest and will inform us about potential heterogeneous prescription behaviours between GPs trained in the UK and abroad. Among the characteristics of the practice, we include the age and gender of the GPs, the size of the GP practice and the composition of its patients by age, gender and ethnicity, as certain demographic features might be linked to different exposure to disease. We also control for disease prevalence and the index of deprivation at GP practice level to take into account the general health conditions of patients in the area and to control for the fact that poorer individuals suffer on average from worse health. Finally, we introduce region-fixed effects to control for the specific time-invariant characteristics of each geographical area.

To better understand whether there is a different prescription behaviour across GPs trained in different areas of the world, we also decompose the GP shares according to the broad geographical area where they received their degrees.

3 Results

Table 1, columns 1-4 present the results of the ordinary least squares estimates of Eq. 1 using the number of prescriptions per patient for four different drug categories, namely antibiotics, mental health, antacids, and analgesics as dependent variables. Our findings highlight a significant and positive relationship between the share of overseas GPs and the number of prescriptions per patient for all the categories of drugs considered. Specifically, in GP practices with higher shares of GPs who have been trained abroad, the number of antibiotics, mental health drugs, antacids and

analgesics prescribed per patient is significantly higher, compared to GP practices where the share of GP trained abroad is lower. This implies that a one-SD increase in the share of GPs trained overseas would increase antibiotics prescriptions by 0.037 over the mean of 0.68, mental health prescriptions by 0.140 over the mean of 2.36, antacids prescriptions by 0.006 over the mean of 0.1 and analgesics prescriptions by 0.084 over the mean of 1.42. Our results show a significant effect of the age of the GPs, while no effect is detected in relation to their gender. In practices with a higher share of younger GPs (less than 45 years old), the number of prescriptions of the four drug-types is smaller, in line with the findings of Wang et al. (2009). Demographic characteristics such as gender and age of patients represent other significant predictors: practices in which more than 50% of the patients are females register lower rates of prescriptions compared to those in which the majority of patients are men, in line with the findings of Orzella et al. (2010). Similarly, higher shares of young patients (under 45) are associated with lower rates of prescriptions. Finally, we also find evidence of higher prescriptions in practices where the proportion of the white population is larger, in line with the findings of Gaskin et al. (2006). Not surprisingly and in line with the findings of Mooney et al. (2022), we find that higher prescribing practices are located in more deprived areas.

Results in Table 2 focus on the geographical area of origin of GPs. More precisely, we decompose the GPs shares according to the area where they received their medical degrees. We observe higher rates of prescriptions for all drugs in practices with a higher share of GPs who studied in South-Asia and Africa, while we do not find any significant effect amongst all other groups of immigrant GPs. Specifically, GPs trained in Africa prescribed 0.17 additional antibiotics per month per patient, 0.8 mental health drugs, and 0.4 analgesics. GPs trained in South Asia prescribed additional 0.17 antibiotics per patient, 0.56 mental health drugs, 0.03 antacids and 0.35 analgesics. Potential explanations may lie in the different approaches in treating diseases, in the higher willingness to satisfy the patients, and in the potential under-prescriptions of drugs by GPs trained in the UK.

In order to understand whether the estimated over-prescription behaviour of foreign-born GPs is driven by the willingness to satisfy patients or whether it is instead the signal of under-prescription behaviour of UK-trained GPs, we estimate two additional models. First, we test the existence of

a significant relationship between the share of foreign-born GP (by country of training) and the three dimensions of patient satisfaction described in Section 2. A positive correlation would suggest that the observed over-prescription behaviour may be driven by the willingness of immigrant GPs to satisfy the requests of their patients. Second, we explore whether the share of overseas GPs (by country of training) are associated with an indicator of unplanned hospitalisations measured at CCG level. A negative correlation would signal potential under-prescribing behaviour by UK-trained GPs, who did not provide the appropriate amount of drugs to their patients. In both models, we include the same set of control variables as in the main specification.

Tables 3 shows the results. In Model 1 the variable of interest is the share of GPs trained abroad while in Model 2 we include GP shares by the geographical area where they received their degrees. Columns 2-4 report the coefficients relating to the patients' satisfaction variables while column 5 reports the coefficients for the unplanned hospitalisation indicator. The share of immigrant GPs appears not to be significantly associated with any of the three patient satisfaction variables considered. Similarly, no significant effect emerges when we use the indicator of unplanned hospitalisations as a dependent variable. This is the case when we use the share of GP immigrants by GP practice as our main variable of interest as well as when we differentiate by their area of training. Our results seem to suggest that immigrant GPs do not try to satisfy patients' requests and neither UK-trained GPs are under-prescribing drugs to their patients. We interpret these results as evidence of overprescribing behaviour by GP immigrants.

4 Discussion

During the COVID-19 pandemic across countries, the alarming shortage of doctors became evident (Unruh et al., 2022), as was the need to recruit new medical staff to support the health system. In the UK, NHS England put together a plan to attract more GPs from abroad and simplified the process for their registration in the UK. Our results show that the drug prescription behaviour in practices with a high percentage of foreign-trained GPs is different compared to that of practices

with a high percentage of GPs trained in the UK. There are many possible explanations, such as the different approaches in treating diseases, the higher willingness to satisfy the patients, and the potential under-prescription of drugs by GPs trained in the UK. Our evidence suggests an over-prescribing behaviour of foreign-trained GPs.

This study brings new evidence to support policymakers in designing better policies for the integration of GPs trained abroad within the UK system. Further research on this topic is necessary, given that half of the doctors in the UK are trained abroad and this percentage is set to increase further in the near future.

5 Tables and Figures

Figure 1. Share of GPs trained abroad by CCGs in England in 2019. Very Low: 0-0.20; Low:0.20-0.40; Medium: 0.40-0.60; High: 0.60-0.80; Very High: >0.80.

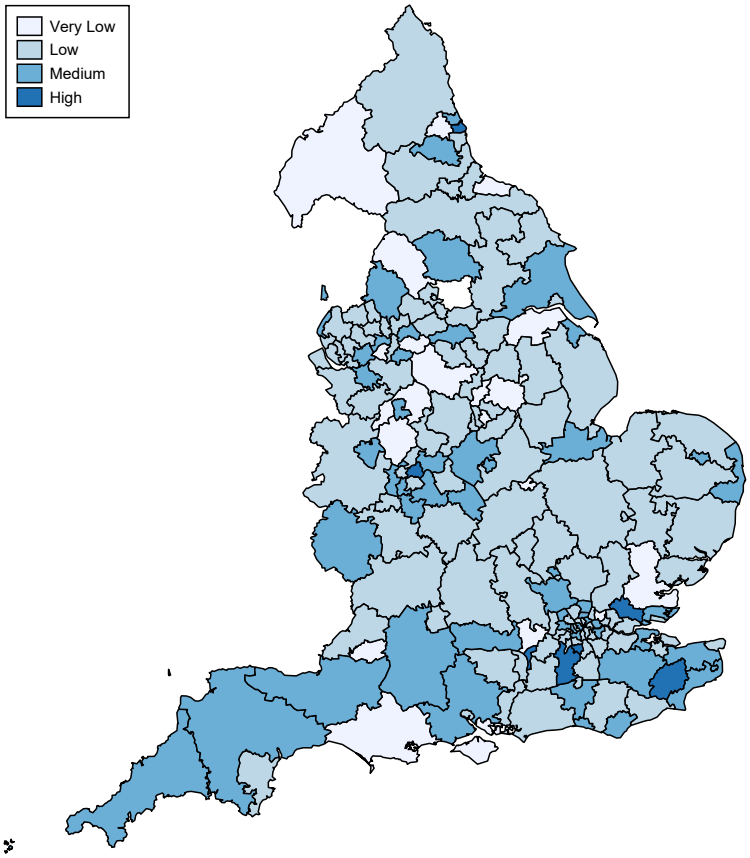

Table 1. OLS: Prescriptions per patient

	Antibiotics	Mental health	Antacids	Analgesics
GP immigrant	0.119***	0.448***	0.020***	0.268***
	(0.040)	(0.145)	(0.007)	(0.086)
Female GP	-0.052	-0.273	-0.008	-0.152
	(0.049)	(0.170)	(0.008)	(0.101)
GP age<45	-0.306***	-0.950***	-0.042***	-0.574***
	(0.046)	(0.157)	(0.007)	(0.093)
Female Patients	-0.211***	-0.707***	-0.028***	-0.418***
	(0.030)	(0.092)	(0.004)	(0.054)
White Patients	0.164*	1.794***	-0.048**	1.136***
	(0.096)	(0.344)	(0.019)	(0.215)
Patient age<45	-1.319*	-5.516***	-0.240***	-3.480***
	(0.790)	(2.070)	(0.087)	(1.213)
Deprivation index	0.004**	0.012**	0.001***	0.008**
	(0.002)	(0.006)	(0.000)	(0.003)
Other controls:				
Disease Prevalence	Yes	Yes	Yes	Yes
Geographical area	Yes	Yes	Yes	Yes
N. Observations	72156	72156	72156	72156

Table 2. OLS: Prescriptions per patient by GP country of origin

	Antibiotics	Mental health	Antacids	Analgesics
GP: EEA	-0.052	-0.187	-0.006	-0.155
	(0.091)	(0.301)	(0.014)	(0.175)
GP: Other EU	0.041	-0.012	0.088	0.332
	(0.237)	(0.813)	(0.117)	(0.635)
GP: Africa	0.167*	0.753**	0.019	0.382*
	(0.095)	(0.361)	(0.014)	(0.213)
GP: Asia	-0.040	0.053	-0.006	0.106
	(0.221)	(0.740)	(0.030)	(0.419)
GP: South Asia	0.171***	0.556***	0.032***	0.354***
	(0.052)	(0.179)	(0.009)	(0.110)
GP: Australia	0.100	0.941	-0.008	0.614
	(0.407)	(1.840)	(0.053)	(0.982)
GP: Centr. America	0.268	1.770	0.013	0.746
	(0.299)	(1.449)	(0.040)	(0.818)
GP: North America	-1.108	-5.648	-0.181	-3.771
	(1.134)	(3.822)	(0.190)	(2.331)
GP: South America	-0.509	-1.511	-0.037	-0.776
	(0.542)	(1.923)	(0.086)	(1.115)
GP: Middle East	-0.045	-0.435	-0.028	-0.212
	(0.158)	(0.650)	(0.022)	(0.360)
Female GP	-0.049	-0.253	-0.008	-0.145
	(0.049)	(0.175)	(0.008)	(0.104)
GP age<45	-0.305***	-0.961***	-0.042***	-0.577***
	(0.046)	(0.156)	(0.007)	(0.092)
Female Patients	-0.210***	-0.709***	-0.028***	-0.417***
	(0.030)	(0.091)	(0.004)	(0.053)
White Patients	0.167*	1.798***	-0.047**	1.145***
	(0.096)	(0.344)	(0.019)	(0.214)
Patients age<45	-1.311*	-5.510***	-0.236***	-3.466***
	(0.792)	(2.079)	(0.087)	(1.216)
Deprivation index	0.004**	0.012**	0.001***	0.008**
	(0.002)	(0.006)	(0.000)	(0.003)
Other controls:				
Disease Prevalence	Yes	Yes	Yes	Yes
Geographical area	Yes	Yes	Yes	Yes
N. Observations	72156	72156	72156	72156

Table 3. Robustness: Patients' Satisfaction & Unplanned Hospitalisations

	Overall Satisfaction	Mental Health Need	Involved in Decisions	Unplanned Hospitalisations
Model 1				
GP immigrant	-0.000	0.005	-0.001	-0.001
	(0.006)	(0.006)	(0.004)	(0.002)
Model 2				
GPs country				
GP: EEA	-0.003	0.007	-0.002	-0.006
	(0.014)	(0.014)	(0.010)	(0.009)
GP: Other EU	-0.041	-0.056*	-0.038	0.024
	(0.042)	(0.033)	(0.027)	(0.024)
GP: Africa	-0.007	0.002	-0.010	-0.005
	(0.013)	(0.013)	(0.009)	(0.008)
GP: Asia	-0.049	-0.006	0.015	-0.004
	(0.034)	(0.037)	(0.024)	(0.035)
GP: South Asia	0.007	0.008	0.002	-0.002
	(0.008)	(0.007)	(0.006)	(0.003)
GP: Australia	0.019	0.065	-0.002	-0.080*
	(0.078)	(0.082)	(0.052)	(0.048)
GP: Centr. America	-0.024	-0.082**	-0.055**	0.034
	(0.039)	(0.037)	(0.028)	(0.038)
GP: North America	-0.018	0.258	-0.373**	-0.016
	(0.224)	(0.233)	(0.183)	(0.166)
GP: South America	-0.012	-0.038	0.002	0.110*
	(0.092)	(0.143)	(0.094)	(0.058)
GP: Middle East	-0.004	0.026	0.012	-0.005
	(0.030)	(0.025)	(0.021)	(0.019)
Other controls	Yes	Yes	Yes	Yes
Disease Prevalence	Yes	Yes	Yes	Yes
Geographical area	Yes	Yes	Yes	No
N. Observations	72156	72156	72156	191

References

Adriaenssens, N., S. Coenen, A. Versporten, A. Muller, G. Minalu, C. Faes, V. Vankerckhoven, M. Aerts, N. Hens, G. Molenberghs, and o. b. o. t. E. P. G. Goossens, Herman (2011). European surveillance of antimicrobial consumption (esac): outpatient quinolone use in Europe (1997–2009). *Journal of Antimicrobial Chemotherapy 66*, vi47–vi56.

Britnell, M. (2019). *Human: solving the global workforce crisis in healthcare*. Oxford University Press.

Cadieux, G., R. Tamblyn, D. Dauphinee, and M. Libman (2007). Predictors of inappropriate antibiotic prescribing among primary care physicians. *Cmaj 177*(8), 877–883.

Chakravorty, I., J. Bamrah, and R. Mehta (2021). Migration of healthcare professionals in post-Brexit Britain. *The Physician 6*(3), 1–8.

Esmail, A., M. Panagioti, and E. Kontopantelis (2017). The potential impact of Brexit and immigration policies on the GP workforce in England: a cross-sectional observational study of GP qualification region and the characteristics of the areas and population they served in September 2016. *BMC medicine 15*(1), 1–12.

Fletcher, E., J. Campbell, E. Pitchforth, A. Freeman, L. Poltawski, J. Lambert, and K. Hawthorne (2020). Comparing international postgraduate training and healthcare context with the UK to streamline overseas GP recruitment: four case studies. *BJGP open 4*(3).

Gaskin, D. J., B. A. Briesacher, R. Limcangco, and B. L. Brigantti (2006). Exploring racial and ethnic disparities in prescription drug spending and use among Medicare beneficiaries. *The American Journal of Geriatric Pharmacotherapy 4*(2), 96–111.

Kozyrskyj, A. L., M. E. Dahl, D. G. Chateau, G. B. Mazowita, T. P. Klassen, and B. J. Law (2004). Evidence-based prescribing of antibiotics for children: role of socioeconomic status and physician characteristics. *Cmaj 171*(2), 139–145.

Majeed, A. (2017). Brexit will put further pressure on the NHS. *BMJ 356*.

Mooney, J., R. Yau, H. Moiz, F. Kidy, A. Evans, S. Hillman, D. Todkill, and S. Shantikumar (2022). Associations between socioeconomic deprivation and pharmaceutical prescribing in primary care in England. *Postgraduate Medical Journal 98*(193–198).

Morrow, G., C. Rothwell, B. Burford, and J. Illing (2013). Cultural dimensions in the transition of overseas medical graduates to the UK workplace. *Medical teacher 35*(10), e1537–e1545.

Neumark, T., L. Brudin, and S. Mölstad (2015). Antibiotic prescribing in primary care by international medical graduates and graduates from Swedish medical schools. *Family practice 32*(3), 343–347.

NHS England (2020). International GP recruitment programme: implementation.

Orzella, L., F. Chini, P. G. Rossi, and P. Borgia (2010). Physician and patient characteristics associated with prescriptions and costs of drugs in the Lazio region of Italy. *Health Policy 95*(2-3), 236–244.

Owen, K., T. Hopkins, T. Shortland, and J. Dale (2019). GP retention in the UK: a worsening crisis. Findings from a cross-sectional survey. *BMJ open 9*(2), e026048.

Radyowijati, A. and H. Haak (2003). Improving antibiotic use in low-income countries: an overview of evidence on determinants. *Social Science & Medicine 57*(4), 733–744.

Sandvik, H., S. Hunskaar, and E. Diaz (2012). Clinical practice patterns among native and immigrant doctors doing out-of-hours work in Norway: a registry-based observational study. *BMJ open 2*(4).

Simpson, J. M. (2018). Where are UK trained doctors? The migrant care law and its implications for the NHS. *BMJ 361*.

Taylor, M. (2020). Why is there a shortage of doctors in the UK? *The Bulletin of the Royal College of Surgeons of England 102*(3), 78–81.

Unruh, L., S. Allin, G. Marchildon, S. Burke, S. Barry, R. Siersbaek, S. Thomas, S. Rajan, A. Koval, M. Alexander, et al. (2022). A comparison of 2020 health policy responses to the covid-19 pandemic in Canada, Ireland, the United Kingdom and the United States of America. *Health Policy 126*(5), 427–437.

Wang, K. Y., P. Seed, P. Schofield, S. Ibrahim, and M. Ashworth (2009). Which practices are high antibiotic prescribers? A cross-sectional analysis. *British Journal of General Practice 59*(567), e315–e320.

Weinhold, I. and S. Gurtner (2014). Understanding shortages of sufficient health care in rural areas. *Health Policy 118*(2), 201–214.

6 Appendix

Tables 4 and 5 report descriptive statistics for GPs and patients, respectively. Table 4 provides information on the GP distribution by gender, age and country of education across English practices in each month of 2019. We observe that GPs are equally split between males and females, while in terms of age, the largest proportion is between 35 and 49 years old (46%), 30% between 50 and 64, 16% below the age of 34, and 6% are older than 65 years old. Approximately 34.6% of GPs have got their medical degree abroad: 15.5% have a degree from South Asia, 4.4% from Africa and 4.4% from the European Union. Finally, we also report the deprivation index constructed at GP practice level.

Patients are split equally among gender; more than 80% are white, approximately 9.3% are Asian and the remaining are either black or have a mixed background (see Table5). The distribution of age is similar by gender, with a slightly thicker right tale of the distribution for females. Figure 2 reports the distributions of the number of prescriptions per patient for the different types of drugs considered (antibiotics, mental health, antacids, and analgesics). On average, patients were prescribed less than one antibiotic and antacid per month in 2019, but 1.4 analgesics and 2.4 mental health drugs.

Table 6 shows descriptive statistics for the patients' satisfaction variables and the unplanned hospitalisations indicator, respectively. Regarding the question on the overall satisfaction with GP services, a relevant portion of the sample (about 47%) declares to be very satisfied. Moreover, about half of the individuals report that healthcare professionals recognised their mental health needs in a satisfactory way, and about 60% of individuals declared to feel very involved in the decisions regarding care treatments. Data on unplanned hospitalisations are available only at the CCG level, thus our sample size is reduced to 191 observations. On average, the percentage of unplanned hospitalisations on the CCG population is about 0.4%, ranging from a value of 0.1% up to almost 0.2%.

Figure 2. Distribution of prescriptions per patient for different drugs.

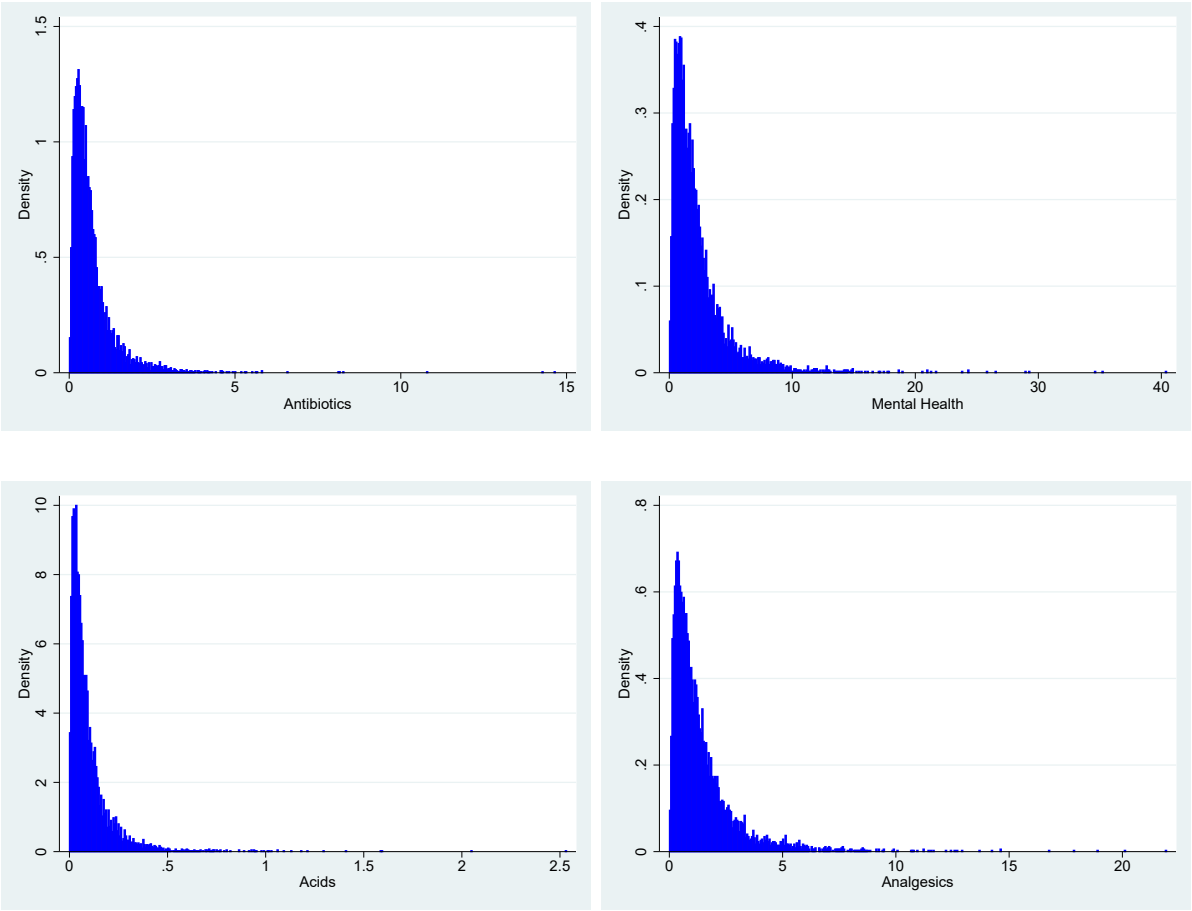

Table 4. Summary statistics (GPs)

	Mean	Std. Dev.	Min	Max	Obs
Gender					
Female	.516	.239	0	1	72156
Country of education					
Immigrant	.346	.312	0	1	72156
EEA	.044	.113	0	1	72156
Other EU	.007	.043	0	1	72156
UK	.654	.312	0	1	72156
Africa	.044	.124	0	1	72156
Asia Other	.004	.037	0	1	72156
Asia South	.155	.249	0	1	72156
Australia/Pacific	.002	.02	0	.5	72156
Central America	.004	.036	0	1	72156
North America	0	.004	0	.167	72156
South America	.001	.015	0	.5	72156
Middle East	.011	.062	0	1	72156
Age-category					
Under 30	.044	.09	0	1	72156
30-34	.117	.146	0	1	72156
35-39	.151	.17	0	1	72156
40-44	.161	.183	0	1	72156
45-49	.15	.191	0	1	72156
50-54	.126	.17	0	1	72156
55-59	.121	.178	0	1	72156
60-64	.056	.131	0	1	72156
65-69	.03	.11	0	1	72156
>70	.033	.127	0	1	72156
Deprivation Index					
IMD	23.247	11.554	3.382	68.834	72156

Table 5. Summary statistics (Patients)

	Mean	Std. Dev.	Min	Max	Obs
Gender					
Female	.497	.025	.159	.686	72156
Ethnicity					
White	.831	.198	.124	.995	72156
Black	.04	.065	0	.437	72156
Asian	.093	.134	.001	.782	72156
Mixed	.024	.018	.001	.114	72156
Age-category by gender					
Male 0-4	.027	.007	0	.081	72156
Male 5-14	.061	.014	0	.147	72156
Male 15-44	.2	.054	0	.642	72156
Male 45-64	.133	.022	.001	.392	72156
Male 65-74	.046	.017	0	.105	72156
Male 75-84	.026	.012	0	.08	72156
Male >85	.009	.005	0	.196	72156
Female 0-4	.026	.007	0	.081	72156
Female 5-14	.058	.013	0	.14	72156
Female 15-44	.194	.047	0	.617	72156
Female 45-64	.126	.025	0	.186	72156
Female 65-74	.048	.019	0	.126	72156
Female 75-84	.031	.013	0	.124	72156
Female>85	.014	.01	0	.536	72156

Table 6. Summary statistics: Patient Satisfaction & Unplanned Hospitalisations

	Mean	Std. Dev.	Min	Max	Obs
Overall Satisfaction	.468	.15	.066	.965	72156
Mental Health Need	.544	.131	.121	.961	72156
Involved in Decision	.604	.112	.228	.949	72156
Unplanned Hospitalisations	.004	.003	.001	.021	191