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Population, workforce, and organisational characteristics affecting appointment rates in primary care: a retrospective cross-sectional analysis

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Keywords: primary care, activity, consultations, access, deprivation, workforce
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Abstract

Background
The recent publication of data on appointment volumes for all practices in England has enabled representative analysis of factors affecting appointment activity rates for the first time.

Aim
To identify population, workforce, and organisational predictors of practice variations in appointment volume.

Design and Setting
Cross-sectional analysis of 6,284 GP practices in England in August to October 2022.

Method
Multivariable regression analysis relating population age and deprivation, numbers of GPs, nurses and other care professionals and organisation characteristics, to numbers of appointments by staff type and to proportions of appointments on the same or next day after booking.

Results
Appointment levels were higher at practices serving rural areas. Practices serving more deprived populations had more appointments with other care professionals but not GPs. One additional full-time equivalent (FTE) GP was associated with an extra 175 appointments over three months. Additional FTEs of other staff types were associated with larger differences in appointment rates (367 appointments per additional nurse and 218 appointments per additional other care professional over three months). There was evidence of substitution between staff types in appointment provision. Levels of staffing were not associated with proportions of same or next day appointments.

Conclusion
Higher staffing levels are associated with more appointment provision, but not speed of appointment availability. New information on activity levels shows evidence of substitution between GPs and other care professionals in appointment provision and demonstrates additional workload for practices serving deprived and rural areas.

Keywords
primary care, activity, consultations, access, deprivation, workforce

How this fits in
Supply and demand predictors of variation in activity levels for all practices in England could not be identified until now. We show that appointment rates per person are higher for practices serving rural areas. Appointment rates with other care professionals are higher in deprived areas but appointment rates with GPs are not. There is clear evidence of substitution between GPs and other care professionals in the provision of appointments.
Introduction

Primary care is in crisis, with workload pressures becoming unsustainable for many practices.\textsuperscript{1,2} General Practitioners (GPs) have the highest rates of burnout and turnover of all medical specialties.\textsuperscript{3} In England, patient-reported satisfaction with access is at an all-time low despite record numbers of appointments being provided.\textsuperscript{4} Increasing access is therefore a key policy priority. The Government have pledged to increase appointment numbers by widening the types of staff that can work in general practice.\textsuperscript{5} However, there is little evidence to support this strategy.\textsuperscript{6} The degree to which other healthcare practitioners can act as substitutes for GPs, and the contribution of different staff types to overall appointment volumes, is unknown.

Recent research has examined associations between workforce composition and several outcomes of importance to patients, staff, and the health system. The number of GPs was found to relate positively to most outcomes.\textsuperscript{6,7} However, numbers of other care professionals were negatively associated with patient-reported access and satisfaction. Other types of health professionals were not found to be substitutes for GPs in terms of outcomes and employing clinicians who were not GPs did not reduce GPs’ workloads.\textsuperscript{8} However, only proxy measures of patient-reported access were examined, such as the time since patients reported last having an appointment. The associations between workforce composition and organisational factors with activity in terms of appointment volumes is unknown. This is critical information for addressing the current primary care crisis.

We examine newly published data on volumes of appointments provided by general practices in England. Our aim is to identify population, workforce, and organisational predictors of practice variations in the volume of appointments provided, a direct measure of patient access.

Methods

Data

We obtained practice-level data on appointments for August to October 2022. These were recently published for the first time.\textsuperscript{9} The data series contains monthly counts of attended appointments at each practice by staff type (classified as GP or other care professional), and time between booking and appointment, covering 98.7\% of practices and 99.8\% of all registered patients in England. The grouping of other care professionals covers a wide range of staff including dispensers, link workers, and practice nurses.\textsuperscript{10} To minimise potential effects of seasonality and volatility, especially as we use the first release of this experimental data, we aggregated the three-months of available data.

We also obtained information on practices’ registered populations and their age composition, and full-time equivalent (FTE) numbers of GPs, nurses, other direct patient care professionals, and administrative staff employed as at October 2022 from NHS GP Workforce data.\textsuperscript{11} Both the appointments and workforce data are publicly available from the NHS Digital website. The appointments data can be examined visually in the NHS Digital Interactive Tool at aggregated levels.\textsuperscript{9}

We used information on the geographical distribution of registered populations from the Patients Registered at a GP Practice dataset\textsuperscript{12}, linked to the most recent Indices of Deprivation for Lower-layer Super Output Areas (LSOAs)\textsuperscript{13}, to calculate population-weighted mean overall index of multiple deprivation (IMD) scores for each practice based on their registered populations’ area of residence. We then assigned practices to deprivation quintiles based on these mean overall IMD scores.

In addition, we included the following practice characteristics sourced from the NHS Payments to General Practice dataset: rurality, contract type, and dispensing status.\textsuperscript{14}
We calculated total appointment volumes, and volumes of appointments with GPs and other care professionals, per 1,000 registered patients. Using the data on time between booking and appointment, we also calculated proportions of appointments that took place on the same or next day of booking.

Appointment volumes were available for all three months for 6,391 practices in England. We excluded 18 practices that had fewer than 1,000 registered patients as these are likely to be serving specific populations or be in the process of opening or closing. We also excluded a further nine practices for which workforce data were not available, 74 practices with “atypical characteristics” such as large fluctuations in patient numbers or part-year data only (as classified in the NHS Payments to General Practice dataset), and six practices for which payments data were not available. We included 6,284 practices in our final analysis.

Analysis

First, we analysed practice variation in the number of appointments provided per 1,000 patients. We used linear regression to estimate associations with FTE numbers of each staff group per 1,000 registered population, population characteristics (age composition and deprivation) and practice characteristics (rural location, contract type, and dispensing status). We ran these analyses first for all appointments, and then for appointments with GPs and with other care professionals separately. As staff type is reported as unknown for some appointments, the separate figures do not sum to the total.

We then examined variation in the proportion of appointments that are seen on the same or next day of booking. We considered appointments with any staff member first, and then appointments with GPs and appointments with other care professionals separately, because appointments with different staff members may differ in urgency and the degree to which they are scheduled further in advance.

In the main analysis we excluded practices with total appointment rates below the 1st percentile or above the 99th percentile to minimise the influence of outliers. We check the sensitivity of the results to this in supplementary analysis. For the analysis of appointment rates with specific staff, we ran a supplementary analysis in which we excluded practices with more than 10% missing information on staff type. For the analysis of proportion of appointments seen shortly after booking, we ran a supplementary analysis in which we excluded practices for which this information was unknown for more than 1% of appointments.

All analysis was undertaken in Stata version 17. Regressions were weighted by the denominator of the dependent variable (registered population for appointment rates and volume of appointments for proportion of appointments seen shortly after booking). Standard errors were adjusted for heteroscedasticity using Stata robust option.

Results

On average, practices delivered 1,414 appointments per 1,000 registered patients in the three months, August to October 2022 (Figure 1, Supplementary Table 1). There was substantial variation between practices in the volume of appointments per 1,000 registered patients (10th percentile: 983, 25th: 1,156, 75th: 1,620, 90th: 1,895). There was also considerable variation in staffing, with an average of 0.58 FTE GPs per 1,000 registered population (10th percentile: 0.27, 90th: 0.93), 0.26 FTE nurses (10th: 0.08, 90th: 0.46), 0.24 FTE other care professionals (10th: 0, 90th: 0.52) and 1.19 FTE administrative staff (10th: 0.73, 90th: 1.67). On average, 49% of appointments were seen on the same or next day of booking. This was higher for GP appointments at 63%.
An additional FTE GP was associated with 175 (95% CI: 144 to 206) more appointments over the three months (Figure 2). Additional FTEs of other clinical staff were associated with larger differences in three-month appointment volumes of 367 (95% CI: 305 to 429) per additional FTE nurse, and 218 (95% CI: 171 to 266) per additional FTE other care professional (Supplementary Table 2).

Practices serving more deprived populations provided significantly more appointments, with practices in the middle quintile providing 63 (95% CI: 39 to 88) and practices in the most deprived quintile providing 89 (95% CI: 58 to 120) more appointments per 1,000 patients over three months compared to practices in the lowest deprivation quintile (Figure 3). Practices located in rural areas provided 47 (95% CI: 19 to 76) more appointments per 1,000 registered population over three months than other practices. Practices on PMS contracts also had higher (28; 95% CI 10 to 46) appointment rates, while dispensing practices had lower (-35; 95% CI -65 to -4) appointment rates (Supplementary Table 2).

As expected, when we examined appointments with specific staff types, we found that more GPs was associated with more appointments with GPs. One additional FTE GP was associated with 298 (95% CI: 277 to 319) more GP appointments over the three months. Higher FTE of other clinical staff were also associated with more appointments with non-GP staff. One additional FTE nurse was associated with 520 (95% CI: 467 to 574) and one additional FTE other care professional was associated with 228 (95% CI: 185 to 271) additional appointments per three months with these staff groups (Figure 2).

We found evidence of substitution between different types of clinical staff since more GPs was associated with lower (-124; 95% CI: -150 to -98) appointment rates with other professionals and more other clinical staff were associated with lower appointment rates with GPs (Nurses: -202 (95% CI: -243 to -161); other care professionals: -52 (95% CI: -82 to -23)) over the three months.

While there was considerable variation in the proportion of appointments that occurred on the same or next day after booking (Figure 1), the associations between levels of staffing and speed of availability was less clear (Supplementary Table 3). There were significant associations only for appointments with other clinical staff; more FTE GPs was associated with a lower (-0.070 (95% CI: -0.084 to -0.056)) proportion of appointments occurring on the same or next day, and more FTE other staff (nurses 0.090 (95% CI: 0.061 to 0.118), other care professionals 0.049 (95% CI: 0.029 to 0.070)) associated with higher proportion of appointments seen soon after booking.

Higher levels of deprivation were associated with higher proportions of appointments seen on the same or next day, especially for GP appointments where there was a 4.2 (95% CI: 2.6 to 5.9) percentage point difference between the highest and lowest deprivation quintiles. PMS practices had lower (-1.7pp (95% CI: -2.8 to -0.7)) proportions of GP appointments seen quickly, and rural practices had lower (-1.9pp (95% CI: -3.2 to -0.7)) proportions of appointments with other staff seen quickly.

In the supplementary analysis, the results were not affected materially by inclusion of the 120 practices with very low or very high appointment rates (Supplementary Table 4). The results were also unaffected by exclusion of practices with more than 10% missing data on staff type or very low or high rates of staff-specific appointments (Supplementary Table 5 and S6). The analysis of proportions of appointments seen on the same or next day after booking was also unaffected by exclusion of practices with poorer quality data.

Discussion

Summary

Improving primary care access is a key policy priority in England, and the Government has pledged to increase appointment availability through expansion of workforce skill-mix. However, the
organisational factors associated with appointment volumes are unknown, especially the degree to which other care practitioners contribute to volumes and act as substitutes for GPs.

We analysed newly available data, investigating the population, workforce and organisational factors associated with appointment volumes. We found that patients registered with practices with more staff per 1,000 population have more appointments. We also find that the variations between practices follow expected patterns in terms of appointments by staff type, with more GPs associated with more GP appointments and more other staff associated with more appointments with other staff. We found substitution between staff types in appointment volumes, because numbers of appointments delivered by other staff groups was lower in practices with higher numbers of FTE GPs per 1,000 patients (and vice versa).

In terms of additional appointment volumes per FTE, we found that nurses were associated with the highest number of additional appointments, followed by other direct patient care professionals. Grossing up to annual figures would suggest one additional FTE GP would be associated with 1,193 additional appointments with GPs or a net of 700 total additional appointments per year, after accounting for staff substitution in the provision of appointments. One additional FTE nurse or other care practitioner would be associated with a net of 1,468 and 874 additional appointments per year, respectively.

Strengths and limitations

To our knowledge, this is the first analysis of the new national practice-level appointments dataset for England. Some previous studies have used national data from surveys but relied on self-reported measures of access, such as estimated time since last appointment. Others have analysed data extracted from practice records but have been restricted to using selected subsets of voluntarily participating practices and often faced tight restrictions on the locational and organisational information they could access. We were able to consider some key factors for all practices in England, taking advantage of the substantial variability in workforce and organisational form that exists for primary care providers. We undertook further analyses to check sensitivity to outliers and potentially poor-quality data.

The main limitations of the analysis result from data availability. Appointments data are published as practice counts so we could not look at patterns for individual patients or different types of patients. At this stage, it is only possible to estimate cross-sectional rather than longitudinal associations.

The appointments in general practice data we examine is a new release, classified by NHS Digital as experimental statistics due to variations in the quality of some data items. For example, due to an issue with how information on healthcare professional type was extracted from practice systems, NHS Digital are only able to classify appointments as occurring with either GPs or “other practice staff”. Whilst we were able to use more granular workforce data to examine how four different staff groups contribute to overall appointment volumes, we were therefore only able to break down who these appointments were actually delivered by using this crude dichotomy of GP versus all other practice staff. NHS Digital identified data quality issues with the recording of appointment mode and duration due to differences in local recording practices and systems, and so we did not use that information in our analyses. Whilst there were initially concerns about the coverage of the data during its earlier development, the August to October 2022 release we analyse covers 98.7% of practices in England and 99.8% of all registered patients. It should be noted that the appointments captured in the data represent the lower bound of true practice activity levels, because certain activities including appointments funded by enhanced access schemes are not included.

Comparison with existing literature
The levels of activity and associations with population characteristics are broadly consistent with previous studies that have used CPRD, THIN, and QRESEARCH. However, these were only able to analyse subsets of practices (<10% of total practices) meaning the results are likely to be less statistically robust. We find an average appointment rate of 1.402 appointments per patient during the three months we examine, which would equate to 5.61 appointments per year. This is broadly in line with consultation rates estimated using CPRD, which have increased over time, from 4.67 in 2007/08 to 5.16 in 2013/14. QRESEARCH data showed decreases in the proportion of patients seen by a GP over time, from 77% in 1995 to 62% in 2006. This has further decreased to 47% in our dataset. The Health Improvement Network (THIN) dataset showed women living in more deprived areas had higher consultation rates. Our regression results show a similar gradient.

Our finding that practices serving more deprived populations provided significantly more appointments per registered patient adds to previous findings of an inverse relationship between deprivation and consultation length. We were unable to consider appointment duration or complexity because these are not consistently measured between different practice system suppliers. However, NHS Digital are working to improve data on these, and this would enable future research to examine these competing elements of appointment provision together for the first time.

We found higher levels of all clinical staff groups were associated with higher levels of appointments, a direct measure of patient access. This differs slightly from previous research that has shown that whilst higher levels of GPs are associated positively with most outcomes, numbers of nurses and other care professionals is negatively associated with patient-reported access and satisfaction.

**Implications for research in policy and practice**

Our analysis provides an interesting snapshot of appointments activity and future work should track changes over time. Future research should also seek to explain these differences, especially why deprived populations have more appointments with other care professionals but not with GPs. The consequences for patient and staff health and well-being should be evaluated.

An important implication from our study is that the published data may be more useful and of better quality than some people feared. The practice variations show many expected patterns and highlight that well-known inequalities in workforce between practices lead to inequalities in the amount of contact patients receive.

Relieving pressure on GPs is often presented as the main policy goal for skill-mix expansions. Our results on substitution between staff types suggest this is possible, but prior research suggests GPs’ job satisfaction and ability to delegate work were not associated with higher levels of other staff. In addition, whilst higher numbers of staff other than GPs are associated with higher appointment volumes and therefore improved access, previous research suggests they are negatively associated with patient-reported access and satisfaction. Whilst access is an important dimension of healthcare quality, the safety and effectiveness of care delivered must also be considered. Increasing appointment volumes has come at the cost of reduced continuity. Together these findings suggest caution is needed when pursuing increased access through skill-mix expansion, as this may come at the price of lower quality.
**Figure 1** Practice-level variation in appointment rates and proportions of appointments seen soon after booking

**Figure 2** Estimated effects of one additional Full-Time Equivalent staff on numbers of appointments per three months

Notes: Coefficients and 95% confidence intervals from multivariable regression models including population and organisational characteristics (see Supplementary Table 2)
Figure 3 Estimated differences in appointment rates between deprivation quintiles

Notes: Estimated differences from the 1st (least deprived) quintile. Coefficients and 95% confidence intervals from multivariable regression models including population and organisational characteristics (see Supplementary Table 2)
Author statement
All authors contributed to the design of the study and the writing of the final manuscript. TZ and MS undertook the analysis. TZ is the guarantor.

The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. TZ affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned have been explained.

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Competing interests declaration
Competing interests: All authors have completed the ICMJE uniform disclosure form and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Public involvement
None.


